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REPRODUCTIVE HAZARDS IN THE WORKPLACE

Foreign Laws and International Agreements

A. Introduction

Various industrial nations and international organizations have developed vigorous programs to protect worker health.[1] These programs are dynamic in that they respond to new findings on health hazards and changing societal values. Some of these foreign programs now include features which deal with reproductive risks in the workplace, and they are being applied to industrial workplaces and health hazards similar to those found in the United States. Therefore, assessment of this foreign experience can be useful to the formulation of new policy in the United States.

This report addresses some of these major foreign developments, and focusses primarily on the European Community (EC) of ten nations. It also deals with West Germany and Sweden, two nations with strong programs for occupational health; and several international agencies and private organizations such as the World Health Organization (WHO), the International Labor Organization (ILO), the Organization for Economic Cooperation and Development (OECD), and the CONCAWE association of European petrochemical firms.

The major finding is that efforts to prevent reproductive hazards are increasing, but have not been fully implemented because of three obstacles: technical uncertainty, economic impacts on industry, and discriminatory impacts on the workforce. Despite growing recognition of the reproductive hazards faced by workers and the consequent increase in political pressure

and political will to prevent such risks, data on the reproductive hazard properties of various chemicals and other agents is incomplete and insufficient to support regulatory actions in many instances. Further, the stagnant economic conditions in many European nations militate against any new regulatory initiatives.

Finally, initiatives to control reproductive hazards are increasingly based on new biological testing and medical research findings which point to the need for differential protections for workers on the basis of sex, reproductive function, and other factors. However, consequent efforts to implement regulations for differential protection are opposed by social policies which promote equal treatment of all workers by eliminating any discriminatory aspects of employment.

Thus, the European experience mirrors the American. Despite different legal frameworks, technical support systems, and cultural factors, European progress in preventing reproductive hazards faces the same obstacles found in the United States.

B. European Community

1. Background

The European Community (EC), derives its authority from the 1957 Treaty of Rome[2] to promulgate directives and regulations with binding force on its member nations.[3] It therefore has authority to preempt and harmonize national laws, but does not prevent its members from taking unilateral actions which are not in conflict with EC legal enactments. EC enactments have been characterized as arising from "closed door negotations that tend to concentrate power in...a small group of participating bureaucrats ... [with] expertise in the highly technical issues that underlie most policies relating to ... pollution or chemical control. At the limit ... [it] can become an instrument for securing international agreements for which there is no significant political support in the individual member states." [4]

The EC has taken numerous steps to establish a common framework and specific actions for protecting worker health in its member states, based on its authority to deal with occupational health which is set forth in Article 118 of the Treaty, and which calls for "cooperation among Member States in... matters relating to.... labour laws and working conditions... prevention of occupational accidents and diseases... occupational hygiene...." But exercise of this authority to protect worker health must be consistent with other Treaty provisions, such as Article 119 which has become of particular importance to the reproductive hazards problem. Article 119 provides that "Each Member State shall.... maintain the application of the principle that men and women should receive equal pay for

equal work"; and has been broadly construed in subsequent EC action to mean "the elimination of all discrimination on grounds of sex with regard to all aspects or conditions of remuneration." [5]

2. Framework and General Principles for Protecting Worker Health

Much effort has gone into the establishment of an EC "framework" to promote safety and health at work. Since this was achieved, the EC has enacted several action programs, uniform standards and other requirements and principles for identifying, monitoring and controlling specific hazards. These are discussed in chronological sequence, particularly as they pertain to reproductive hazards in the workplace.

Following the establishment in 1974 of an official "Advisory Committee on Safety, Hygiene and Health Protection at Work", with the broad mandate to assist the EC "in the preparation and implementation of activities" pertaining to "health protection at work",[6] numerous proposals came before the EC for enactment. By late 1977, a lengthy draft resolution on an "action progrmme on safety and health at work" was under consideration, and was based, in part, on prior EC experience in the nuclear field for worker protection from radiation hazards.[7] This historical foundation, subsequently discussed, contains key provisions for differential protection of workers based on sex and reproductive status.

The draft resolution dealt with various elements of a common approach to occupational health protection, including the "handling of dangerous substances", "determination of exposure limits for workers", special initiatives on carcinogens in the workplace, "more extensive monitoring" including a significant and new emphasis on human or biological monitoring, efforts to understand disease etiology, and other matters. Although silent on the subject of reproductive risks, the draft set forth a finding that "account will have to be taken not only of individual sensitivity... but also of some special groups of workers such as

adolescents and women"; and established an overall objective of "contributing to the establishment and maintanance of the highest possible degree of physical and mental well-being of the worker.[8]

The draft resolution was then approved in principle by the EC's European Parliment, in a Resolution which emphasized eighteen points, one being that the Parliment "Welcomes the attempt to assign individuals to jobs for which they are most suited, and to offer protection to... women, not only in case of pregnancy, but during all their child-bearing years."[9]

This was followed by EC enactment of an Action Programme for Safety and Health at Work in June 1978.[10] The Action Programme and its Annex provides the basic framework for subsequent EC actions on specific issues and hazards, and resembles in scope the enabling legislation for occupational health in the United States, the Occupational Safety and Health Act of 1970.[11]

Several provisions of the Programme indirectly relate to future EC actions for the control of some reproductive risks in the workplace. For example, in calling for "new monitoring... methods for the assessment of individual exposure.... through.... sensitive biological indicators.... Special attention [is to] be given to... the case of women, expecially of expectant mothers..."[12] This "special attention" concept is reinforced by other provisions which, for example, call for occupational medicine personnel to provide services which pertain to the assignment of workers "to jobs for which they are suited"; [13] and which call for special education of "certain population groups (such as parent's associations... women's associations)".[14] However, reproductive hazards are not explicitly

addressed as a general problem; although reference is made to the existing standards for protection against radiation as" an example of joint health policy... [which] should be extended to other pollutants present at the workplace."[15] As noted earlier, the radiation standards deal with reproductive hazards and involve sexual differentiation.

Thus, the foundation was laid for subsequent EC enactments. Some of these subsequent measures deal with specific hazards such as lead exposure, and will be discussed in the next section. Others deal with broad sets of generic requirements and are discussed here.

By March 1979, the EC Council had before it a broad proposal for a directive to protect workers "from harmful exposure to chemical, physical, and biological agents at work." The proposed directive sought to bring the approved action programme to bear on specific agents, but did not expressly address the issue of reproductive hazards.[16] The proposed directive was approved by the European Parliment, which once again, expressed its opinion that specific hazards should be dealt with by actions "in emulation of what has already been achieved for protection against exposure to ionizing radiation..."[17] Various text changes to the proposed directive were then recommended by the Commission of the European Communities, and in one respect these indirectly dealt with reproductive hazards by calling for information to be provided to "workers and the potential risks to which they and members of their households and families are exposed.[18]

Finally, the EC promulgated its Council Directive on the Protection of Workers from the Risks Related to Exposure to Chemical, Physical and Biological Agents at Work in November 1980.[19] The Directive requires member

states to adopt various measures pertaining to the restriction of worker exposure to a short list of specific agents, various surveillance methods and information disclosure duties, and outlines the elements of a decision-making process for the various agents. Although silent once again on any medical categories of risk, such as reproductive risks, the Directive provides for what is likely to become a critical issue in future EC attempts to limit worker exposure to reproductive hazards: "any worker temporarily suspended on medical grounds .... from exposure to.... an agent is, where possible, provided with another job."[20] It appears that this provision was included to allay the fears of workers that the use of biological (human) monitoring techniques would lead to job termination for workers determined to be at higher risk.[21]

By November 1982, another broad plan had been proposed. This "second action programme" is designed to ensure a standard methodology and approach to establishing exposure limits for toxic agents. It specifies action on carcinogenic agents, and for the first time, expressly calls for action on mutagens and teratogens, and hazards arising from biotechnology developments.[22] In its formal opinion on the proposed action programme, the Economic and Social Committee has stressed efforts to deal with carcinogenic risks and the use of cost-benefit analysis, but has not commented on mutagenic and teratogenic risks or on differential protection or special concerns on the basis of sex and reproductive function.[23]

Two other broad initiatives have been taken by the EC which have the effect of protecting the health of workers, but which transcend the field of occupational health because they are directed at controlling the chemical

industry in general. The first is the EC's Directive on Classification, Packaging and Labelling of Dangerous Substances, which was promulgated in 1967 and has since been amended several times, most importantly by the so-called Sixth Amendment in 1979.[24] This Directive and its amendments require manufacturers and importers of chemicals to provide certain public notification, packaging and labels for some 900 designated substances (as well as others in generic product categories), which are explosive, oxidizing, flammable, toxic, carcinogenic, teratogenic, mutagenic or otherwise harmful. It resembles the recent "Hazard Communication" rule promulgated by the U.S. Occupational Safety and Health Administration, [25] and other features of American chemical control laws, such as the U.S. Toxic Substances Control Act, and is designed to benefit workers, consumers, the general public and industrial customers.

Mutagenic substances are now defined by the Sixth Amendment as those which fall into the following three categories:

> (1) "known to be mutagenic to man" because "there is sufficient evidence to establish a causal association between human exposure... and heritable genetic damage;
>
> (2) "should be regarded " as if mutagenic to man because "there is sufficient evidence to establish a strong presumption that human exposure... may result in.... heritable genetic damage, generally on the basis of appropriate animal studies [or] other relevant information."
>
> (3) "which cause concern... owing to possible mutagenic effects but... the available information does not satisfactorily demonstrate heritable genetic damage. There is evidence from appropriate mutagenicity studies, but this is insufficient to place the substance in category 2."

Specific "risk phrases", classifications and symbols are then designated for use by manufacturers and importers of such substances which meet these categorizations to comply with the various provisions of the Directive.[26]

Teratogens are similarly defined, but for only two categories:

(1) "known to be teratogenic to man" because of "sufficient evidence to establish a causal association between human exposure... and subsequent non-heritable birth defects in offspring.

(2) "should be regarded" as if teratogenic to man, because there is sufficient evidence to provide a strong presumption that human exposure... may result in non-heritable birth defects in offspring, generally on the basis of appropriate animal studies [or] other relevant information."

As with mutagens, specfic "risk phrases", classifications and symbols are then designated for use to comply with the various requirements of the Directive.[27]

The most recent amendments, in 1983, emphasized recognition of mutagens and teratogens, and requirements as to testing, notification, classification, packaging, and labelling. An "Annex" to these amendments also imposes a special duty on Member States to notify the EC if they have good reason to believe that the requirements are innappropriate regarding mutagenic and teratogenic effects.[28]

A second EC initiative aimed at the chemical industry will also benefit worker health, but is not explicit on the issue of reproductive hazards. It is the so-called "Seveso Directive", enacted as a Council Directive on Major Accident Hazards of Certain Industrial Activities, following the Seveso, Italy facility explosion and subsequent dioxin contamination of the community.[29] It provides for hazard information disclosures, planning, inspections, and preventative measures by industry and member governments to reduce the risk of industrial accidents and the acute and long-term health hazards following accidents.

Thus, the EC struggles on to achieve a structured and harmonized approach to reaching general principles for controlling chemical and other hazards in the workplace.[30] In addition to be foregoing broad developments, it has sought to apply the general principles to actual problems by enacting standards and guidances for specific substances and their reproductive and other health hazards. As discussed in the next section, the process of applying generalities to specific hazards to reproduction is becoming a field of conflict for opposing interests.

3. Standards for Specific Substances

The EC has enacted generic standards which deal with specific hazards to workers, consumers and the environment. Some of these standards seek to achieve "total harmonization, where member governments are obliged to respect the Community requirements to the letter"; others seek "optional harmonization, where the Community typically sets uniform minimum standards but otherwise permits some national deviation...[e.g.] the ability to set variabl controls... [including] choice of control option and the severity of the standard."[31]

A recent study concluded that very few measures attempt total harmonization, but that the Council's Directive on Classification, Packaging, and Labelling for some 900 chemicals and additional product categories, discussed earlier, marks its most impressive harmonization effort even though member nations are permitted to impose certain additional restrictions.[32] The study also identified several standards which approach total harmonization for specific substances, such as the restrictions which now cover PCB's, PCT's, vinyl chloride monomer as an aerosol propellant, Tris, and certain pesticides that contain designated mercury compounds or several organochlorine compounds.[33]

For other cases of chemical control by the EC, the study concluded that the EC enactments "leave ample room for the exercise of national discretion." Thus, the three EC minimum standards enacted to date, vinyl chloride, lead and asbestos, permit member governments to impose more restrictive controls, and presumably this discretion will be maintained in future EC efforts to

establish minimum standards for specific hazards, with possible exceptions for certain aspects of commerce in pesticides and food additives.[34]

The EC's Health and Safety Directorate has also initiated a series of monographs on "human biological monitoring of industrial chemicals" to inform and guide occupational health practices in member states. Finally, EC Directives have adopted various standards for protection from ionizing radiation, under authority conferred by a separate atomic energy treaty linking its members on matters involving nuclear energy and radioactive materials.

Some of these standards and other enactments contain provisions to protect workers from reproductive hazards. For example, the Directive on Classification, Packaging, and Labelling,[35] discussed earlier, sets forth certain criteria and requirements for mutagens and teratogens among the over 900 substances subject to the Directive.

The radiation standards also provide certain measures designed to control reproductive hazards. The significance of these standards is considerable for several reasons. First of all, since 1959 they have provided for protection against the well established radiation hazards to the reproductive functions of workers. Secondly, they have relied on monitoring of individual exposures. Third, they set forth differential restrictions on the basis of sex and reproductive biology. Fourth, they have been cited as a model to follow in setting EC standards for other hazards, as discussed in the preceeding section.

Thus, the EC's first Council Directive Laying Down the Basic Standards for the Protection of the Health of Workers and the General Public Against

the Dangers Arising from Ionizing Radiations,[36] in 1959, required that "During pregnancy or the nursing period, women must not be employed in work involving a risk of high exposure."[37] It also set exposure limits for "doses received by blood forming organs and the gonads";[38] provided that "No woman of reproductive capacity may be subjected to.... [planned abnormal external and internal exposures]"; [39] established reliance for implementation on "medical surveillance"; and vested in the industrial medical practitioner complete discretion to determine a worker's job placement or ineligibility "if the medical findings are unfavorable."[40]

Subsequent EC Directives on ionizing radiation have reinforced this approach. Thus, the 1976 Directive [41] defined "genetic dose";[42] reiterated total exclusion of women from work involving a risk of high exposure "during pregnancy or the nursing period";[43] established principles for women to declare pregnancy and for protection of the fetus between "declaration of pregnancy and the date of delivery" [44]; and set new dose restrictions for exposure of the "bone marrow, gonads", and other organs.[45] It also reaffirmed the vesting of discretion in occupational medicine practitioners to classify workers for purposes of job placement and removal, and required such doctors to establish criteria to determine "a worker's fitness to be exposed to ionizing radiation."[46]

The most recent Council Directive amends previous Directives on ionizing radiation, and was enacted in March 1980. It imposes additional requirements to reinforce medical surveillance and findings as to fitness for work of various categories of workers. It also mandates pre-employment medical examinations of job applicants, compilation of medical records,

special surveillance of certain workers, and the development by member states of criteria for "judging a worker's fitness to be exposed to ionizing radiation."[47]

EC efforts to set standards for specific chemical substances are now following a similar pattern, one which involves medical surveillance and biological monitoring, and which attempts to separate workers into different categories based on criteria and findings as to their fitness for work. Thus, the EC has embarked on an approach to worker protection which, to some, involves the shifting of the burden of providing safe workplaces from employer to employee.[48]

For example, the EC Health and Safety Directorate has initiated publication of a monograph series on "Human Biological Monitoring of Industrial Chemicals," to provide the practicing occupational doctor with up to date information on the possibilities and limitations of biological monitoring for specific chemical agents. Three monographs, on benzene, manganese and titanium have been published to date, and involve assessments of cytogenetic studies of chromosomal aberrations, and other evidence of mutagenic, teratogenic and carcinogenic effects. Although these three studies indicate no findings of mutagenicity or teratogenicity for manganese and titanium, and "no dose-effect relationship... for hemgene induced chromosome aberrations", such biological monitoring and medical surveillance approaches always carry the potential for classifying workers by susceptibility to reproductive and other hazards, and therefore provide a rational basis for differential worker protection standards and job eligibility requirements. This stands in contrast to earlier exclusive reliance on ambient (e.g., air) monitoring approaches, which did not directly involve issues of differential worker sensitivity.

Studies of worker absorption of cadmium have revealed differential absorption rates due in part to iron deficiencies of some female workers, and the researchers concluded that observations of adult male workers "may not necessarily be valid for other groups of the general population." [49] Similar differentials have been determined in EC research on lead uptake by males and females.[50] A recent French study of benzene exposure and its effects reached several findings, including one pertaining to sex of exposed persons: "women appear to be more susceptible during pregnancy and lactation... the same specific protection rule must apply, because of the risk of mutagenesis." [51]

These considerations and potential conflicts have become manifest in the EC's process of enacting a uniform standard for protection of workers from lead exposure and reproductive hazards, one of three such uniform standards for specific substances (asbestos and PVC being the others). In December 1979, a proposed Directive on worker exposure to lead was submitted for Council consideration.[52] In its preamble, a reproductive risk was emphasized, namely, that "ionic lead compounds are known to cross the placental barrier and may have embryotoxic effects.[53] Exposure limit values were proposed, including a biological [limit] value for workers, with the exception of workers of child-bearing capacity [at] 70 mg. Pb/100 ml. blood." A separate, more stringent biological limit value for "workers of child-bearing capacity" was proposed at 45 mg., Pb/100 ml. blood.[54]

This differential protection to be achieved through biological monitoring was maintained in other provisions setting forth interim levels of protection to be achieved by 1 January 1985.[55] The proposed Directive

further mandated "the immediate removal of the worker" as one of several protective options to be used by member nations when the specific limits have been exceeded or "where the appointed doctor advises against such further exposure;[56] and specified that "Female workers shall, in particular, be informed of the potential health risk presented by lead exposure during the early months of pregnancy.[57]

The EC advisory body on such matters, the Economic and Social Committee, made several recommendations in November 1980 which were deemed serious enough to postpone passage of the proposed lead standard. It essentially called for a lowering of the proposed limit values, and a gradual plan for reducing the limit values so as not to disrupt industrial activities; and found no significant evidence that male workers are threatened with sterility because of lead exposure. However, the Committee also concluded that special protection must be used for women of child-bearing age and for pregnant women until technical measures became effective enough to eliminate discrimination between men and women.[58]

The proposed lead standard with potential effects on about one million workers and some twenty-five sectors of industrial activity in the EC, was then hotly debated in the European Parliment in April 1981.[59] Opponents argued that its standards are "unattainable by industry", not reliably measurable, and unacceptable to any of the member states; and would "create at least half a million unemployed... by shutting down the entire lead smelting and refining industry this side of the iron curtain."[60]

Others argued in support of a special report on the proposed directive, which recommended changes to provide equal treatment of men and women by

means of a single standard protective of both, since differential treatment "would result in an enormous number of women losing their jobs in many industries," which would exacerbate a situation in which "unemployment among women is already far higher than among men." They further argued that a differential protection scheme was not sound since "damage caused by lead both to the woman's ovum and to the man's spermatozoon can result in an embryo developing into a handicapped child. The only difference is that it is far easier to provide legal evidence in the case of women than in the case of men. Both the European trade union movements and major medical organizations have therefore advocated that a safe level should apply to men and women..."[61]

Arguments in support of the single protective standard for both sexes also cited the single standard approach in effect in the Netherlands; reports of the World Health Organization and health risk studies by the EC and Italy which found the proposed male exposure level unsafe; prior resolutions of the Parliment which forbid discrimination between men and women in the workplace; and a trade union position that called for (1) surveillance to be voluntary so it "cannot be used as a means of grading the workforce, (2) men and women to be treated equally, and (3) substantially reduced (more stringent) limit values to be adopted.[62]

Various aspects of the proposed Directive's differential standards were further attacked on the basis of health and medical reports which indicated that its ambient level values were too high, its human or biological values were inadequate, and that using the worker's body to measure health risks was unacceptable. Some advocated a single blood lead level of 30 mg

Pb/100 ml. blood for both men and women; and others cited the ability of industry to achieve such low levels over a proposed ten year period.[63]

Thus, the conflicts between non-discrimination as a social policy, and biological testing and differentiation in protecting workers became mixed with the more traditional conflicts between health and economic interests, all in the context of the lead standard's provisons for reproductive risks.

The Parliment then voted on various aspects of the proposed Directive, and approved various amendments to its text.[64] These amendments included the following:

(1) To increase the frequency of ambient (air) monitoring from the proposed once per year to at least four times per year, with a worker right to seek more air tests if necessary.[65]

(2) To require that medical surveillance and biological monitoring are paid for by the employer, and to increase the frequency of urine, but not blood testing, but to establish that "the blood lead level shall always predominate if there is conflict or contradiction in other findings."[66]

(3) To allow the application of the proposed differential biological limit values for workers of child bearing capacity "until such time as measures are taken to have these limits applied to all workers... After that date, the.... biolgical values [for workers of child-bearing capacity] shall apply to all workers.... irrespective of sex or age."[67]

(4) To require that workers confirmed as pregnant, and subject to medical removal under the proposed Directive, "be entitled to return to the post occupied by them prior to their pregnancy [upon return from maternity leave]."[68]

(5) To require that by 1 January 1985, member states ensure that thereafter a single biological limit value of 45 mg Pb/100 ml. blood shall become effective for all workers, irrespective of sex or age; with compliance to be scheduled on a date to be specified in the future.[69]

(6) To require that medical removal determinations, because biological limit values have been exceeded, be made "by the person medically responsible."[70]

(7) To require that the duty to inform female workers of health risks presented by lead exposure during the early months of pregnancy be expanded to a duty to inform female workers of health risks to unborn children following lead exposure, "prior to and throughout pregnancy"; and be extended to cover male workers, who must be warned of "the potential risk of male spermatozoa being effected by lead."[71]

This led to a reconsideration of the proposed lead standard and the Parliment's amendments; and the Council them promulgated its final Directive on the Protection of Workers from the Risks Related to Exposure to Metallic Lead and its Ionic Compounds at Work in July 1982.[72]

The resulting standard is less stringent than the one first proposed, but it is uniformly applicable to male and female workers, without any differentiations on the basis of sex or age or reproductive function.

Both air monitoring and lead in blood monitoring are mandated, with findings of certain lead levels to serve as triggers for various protective measures. Thus, if a worker's blood lead level exceeds 40 mg. Pb/100 ml. blood, adequate information is to be provided the worker "on the potential risks to health from lead exposure including the potential risk for the fetus and infants being breast-fed, along with information on the need for biological monitoring and various hygienic measures and other precautions. If the blood lead level ranges between 40 and 50 mg., biological monitoring is recommended, in accordance with "the procedures lead down by the Member States." If the level exceeds 50 mg., lead in air monitoring and medical surveillance procedures are prescribed along with various hygienic procedures and personal protection equipment. If it exceeds 60 mg., an immediate clinical examination and subsequent clinical and biological monitoring tests are to be conducted at short intervals. The doctor or person in charge of medical surveillance may then advise on protective measures, including partial or total medical removal of the worker.[73]

Finally, an overall limit of 70 mg., with a permitted level of 80 mg., under certain limited conditions, is mandated for all workers, along with a statement of intent to establish 70 mg., as the sole maximum limit, within five years of the enactment of the Directive. When the 70 mg., level is exceeded, a more intensive study must be conducted to determine the causes, and upon medical determination, the worker may be withdrawn from the workplace, but may be assigned "to other work involving a lesser risk of exposure."[74]

Thus, the final solution reflects some drastic trade-offs. On the one hand, the discriminatory language and differential requirements of the proposed standard have been expunged. On the other hand, reliance on biological monitoring has been increased, health protection requirements and action-forcing measures applicable to industry have been somewhat diminished, and the discretion provided to member states for implementation and enforcement measures has been increased. Put another way, EC sanctioned discrimination was eliminated at the price of less uniformity and somewhat less health protection. Of course, worsening economic conditions in the EC, over recent years, also influenced the outcome.

Nevertheless, it should be recognized that the solution marks a successful effort to use the powers of biological monitoring and medical surveillance in a uniformly protective manner, and to exclude discriminatory outcomes which were previously considered as inevitable.

The convergence of issues involved in enactment of the EC lead standard has not occurred in the setting of its two other standards, PVC and asbestos, nor in the development of its broad generic requirements for occupational health and chemicals control, discussed in the prior section. But the experience can be expected to influence future EC standard setting, particularly for mutagens and teratogens, where the potential for differential standards on the basis of sex and age is greatest.

At this time, the EC has taken no steps, nor made any formal plans, to establish mutagens and teratogens, or reproductive hazards, as priorities for standard setting or other official action.[75] No official or influential lists of mutagens and teratogens have been issued by either the EC or its

member states, although official lists of carcinogens have been established.[76] The European Trades Union Conference (ETUC) has set forth a program of "concrete demands" for EC and other actions on toxic substances, including mutagens and teratogens;[77] and such internal pressures coupled with possible external findings on reproductive hazards in the United States, and at the World Health Organization, could stimulate EC concern and action.

4. Equal Treatment

The development of uniform principles for the equal treatment of men and women on job-related matters has been a major concern of the EC. The Treaty of Rome, which established the EC in 1957, provides that "each Member State shall ensure... and maintain the application of the principle that men and women should receive equal pay for equal work," and defines "pay" broadly to include wages "and any other considerations, whether in cash or in kind, which the worker receives, directly or indirectly, in respect of his employment from his employer."[78]

EC implementation of this mandate could serve as an important legal constraint on the promulgation of Directives and other requirements for the protection of workers from occupational hazards, particularly reproductive hazards which have considerable potential for generating differential requirements on the basis of sex. To some extent, this influence was felt in the enactment of the EC's lead standard, discussed earlier. But review of EC implementation of this mandate reveals its limitations as a legal constraint, despite the fact that equal treatment has become a potent political force.

In February 1975, an EC Council Directive set forth basic general objectives and principles, based on its recognition "that priority should be given to action taken on behalf of women as regards access to employment... and as regards working conditions, including pay."[79] It defined the "principle of equal pay" to mean "for the same work... the elimination of all discrimination on grounds of sex with regard to all aspects and conditions of remuneration"; and required member states to enact enabling

laws and other measures to assure implementation; but did not specifically address occupational health based grounds for discrimination.[80]

This was followed by a second Council Directive in February 1976, which set forth a more detailed set of requirements, based on a broad principle of "equal treatment" of men and women as regards access to employment, training, promotion, working conditions and other matters; despite explicit recognition that the basic EC Treaty" does not confer the necessary specific power for this purpose."[81] However, the EC refused to extend "equal treatment" to certain aspects of the occupational environment, by providing that the new Directive would be "without prejudice to the right of Member States to exclude from its field of application those occupational activities.... for which, by reason of their nature... the sex of the worker constitutes a determining factor." It also provided that "the Directive shall be without prejudice to provisions concerning the protection of women, particularly as regards pregnancy and maternity."[82]

A third Council Directive, enacted in December 1978, applied the "equal treatment" principle to matters of social security for men and women; and defined social security to include "statutory schemes which provide protection against the risks of sickness, invalidity,... accidents at work, occupational diseases..." However, once again, the principle was defined so as not to prejudice "the provisions relating to the protection of women on the grounds of maternity... in this respect, Member States may adopt specific provisions for women to remove existing instances of unequal treatment.[83] Thus, equalization of compensation under various benefits

programs was enunciated for all workers, except "women on the grounds of maternity."[84]

Finally, a proposed fourth Directive was submitted to the Council in May 1983, to seek further extensions of the principle of equal treatment to social security schemes. It reiterates the by-now traditional limitation that it does not apply to "the protection of women on the ground of maternity."[85]

Conflicts over these measures and over continuing forms of discrimination have occurred in the European Parliment. Some members have protested that "A great many promises have been made... Very little has been achieved " by the EC in assuring that national legislation implements the EC Directive; and that national regulations still discriminate against women by finding them ineligible for certain "strenuous" and other activities, even though "these rules have been laid down by men as a means of preserving their own monopoly of a particular economic activity." Other members have resisted implementation: "It should be common knowledge by now that pretty well the whole of the population - not least the women - regard many of these measures... as either self-evident, pointless or downright ridiculous."[86]

Thus, the principles set forth in the foregoing Directives are not being vigorously pursued,[87] and have severe limitations on their applicability to systems for compensating women for certain jobs with reproductive risks. Since compensation is a force for promoting deterrence or preventative actions by firms to protect workers,[88] inadequate compensation schemes for women workers, coupled with the ease with which they can be excluded from jobs on grounds of maternity, cannot be expected to force

industry to provide healthy work environments and equal job opportunities for women of child-bearing years.

Probably the most significant weakness underlying these EC initiations arises from the decision of the EC High Court in the case of Defrenne v. Sabena Airlines.[89] The plaintiff, a former stewardess, lost her job on her 40th birthday, because of defendant's age restrictions on women flight crew members. She brought suit on the theory that Article 119 of the EC Treaty requires equal conditions of employment for men and women, and in particular, prohibits sex and age discrimination as practiced by Sabena. The court held that Article 119, which prescribes equal pay, cannot be construed as prescribing "in respect of other working conditions applicable to men and women"; that the fixing of certain terms of employment which may have pecuniary consequences is not sufficieint to bring such conditions within the scope of Article 119; and that such other forms of discrimination in relationships between employer and employee are a matter exclusively for national law. Thus, the very source of EC authority to promote equal employment conditions, Article 119 of the Treaty of Rome, has been narrowly construed to apply only to matters of equal pay.

In light of these legal and other limitations on EC efforts to promote equal treatment for occupational matters, and in light of the even more restricted approach taken by the EC to defining the rights of handicapped persons, (which have not been interpreted as including sensitive persons or those specially susceptible to workplace hazards) the only real force in the EC against sex and age discrimination that can be brought to bear on future standard setting for reproductive hazards is political in nature. This was

clearly demonstrated in the enactment of the lead standard Directive, but it does not provide the assurance of continued effect that a legal right would provide. Thus, equal treatment in the EC is left to the vagaries of politics and the initiatives of individual member states.

C. West Germany

West Germany provides a highly structured framework of laws, regulations, agencies, and advisory bodies for the protection of occupational health;[90] but has not enacted legislation which directly addresses reproductive hazards in the workplace. However, as reproductive hazards became identified and action to prevent such hazards is promoted by unions and other interest groups, the German structure is fully capable of responding by means of appropriate technical studies and legal actions.

The German response to any emergent concerns about reproductive hazards can be predicted. It will entail management-union negotiations at the plant level; the development of findings by advisory bodies as to the necessary measures to abate such hazards and the use of such findings to support regulations; and strong initiatives by various German representatives in international organizations such as the EC and the OECD to bring about a uniform regulatory approach to the problem to the fullest extent possible.

The basis for these predictions lies in the German post-war experience. Germany has become the dominant member of the EC because of its industrial strength. Its chemical industry is at the core of this strength, ranking third among western industrial nations in chemical production, and first in chemical exports. Further, the industry is heavily influenced by three major firms, BASF, Bayer, and Hoechst, which account for 80% of its production; and the industry trade association, VCI, now plays a very significant role in any German government processes which lead to the enactment of laws and regulations for health and environmental protection. VCI also plays a leading role in chemical control and health protection

activities in the EC, OECD, and other international organizations, in order to bring about regulatory harmonization on an international scale, an outcome that German chemical firms always want in order to continue their substantial export trade without the obstacles which different regulatory controls would create.[91]

The German government has relied on various technical advisory bodies in dealing with occupational health problems, as it has in other industrial health and safety areas such as those involving pesticides and food additives. German trade unions have not given occupational health a high priority until recent years, but have continuously given precedence to obtaining government actions which provide "institutional mechanisms for dealing with health and safety issues at the plant level."[92]

The framework for dealing with chemical health hazards in the workplace is provided by Article 19 of the Chemicals Act of 1980.[93] Article 19 sets forth national authority to prescribe work conditions, the purchasing and labelling of substances, and various other measures including the monitoring of worker health and the duty of employers to have employees medically examined. The statutory goal is "to protect human life or health including worker protection and humane job planning." Other sections of the Act establish a notification and testing system for new chemicals which is consistent with the terms of the EC "Sixth Amendment."[94]

The Act establishes that protection under all its provisions, including Article 19, is to be afforded from exposure to "dangerous substances", and in general terms lists certain attributes of such substances, including "teratogenic" and "mutagenic" attributes, along with others such as "toxic",

"very toxic", and "other extremely harmful properties...capable of altering... ... the balance of nature... to such an extent that people are considerably endagnered or put at a considerable disadvantage."[95] In presenting what data is needed for the notification process involving new chemicals to be introduced into commerce, the Act requires "test documents" which include the results of various tests including those for indications of "carcinogenic, mutagenic and teratogenic properties" and "impairment of fertility" properties.[96] Government restrictions, on the manufacture, use or introduction into commerce of certain chemicals are authorized if certain hazards cannot be fully eliminated by classification, packaging or labelling. The hazards include carcinogenicity, mutagenicity, and teratogenicity which have been "substantiated in view of the state of the art of scientific knowledge at the time."[97]

Authority to monitor is extensive, and provides to certain officials the power "to ensure and inspect sites, offices and workers.. to examine work facilities and worker safety provisions, to examine working processes and in particular to determine and measure the presence and concentration of dangerous substances... to prevent imminent threats, [by conducting such] measures... in living quarters and at any time of day of night."[98] To ensure that inspection in "living quarters" can be conducted, the Act requires cooperation, "particularly... to open up rooms and any type of container... to enable samples to be taken. The basic right of inviolability of the home... is restricted in this respect."[99]

To implement this Act, ordinances and regulations have been enacted, and earlier rules reissued, which for example, establish a "Committee on Dangerous

Substances in the Occupational Environment" to determine specific controls and other protective requirements;[100] impose various restrictions on the employment of pregnant women, and nursing mothers in activities involving specified substances;[101] require a health card to be drawn up by the employer for each employee examined, indicating the nature of the potential hazard, the type of activity, earlier activities in which there was a potential hazard, the dates and results of medical exams and other matters; [102] prohibit continued employment of an employee with an adverse medical examination report;[103] provide detailed safety rules for work involving certain listed substances including arsenic, benzene and lead;[104] and require hiring of industrial medical officers by firms to examine employees and assess their working capacity and supervise occupational health and safety conditions.[105]

After passage of the Chemicals Act of 1980, these ordinances were reissued along with some new regulatory provisions. One new provision, reflecting German pressure for both international uniformity of regulation and continued export trade opportunities, prevents many of the protective requirements of these ordinances from applying to chemicals exported "to countries outside the European Communities, or to countries within the European Communities where no provisions have yet been enacted for the implementation of the EC Council and Commission Directives indicated," such as the EC's Sixth Amendment.[106] German eagerness for international uniformity has also resulted in the passage of the "Twelfth Regulation", which is consistent with the EC's "Seveso Directive" on the Major Accident Hazards of Certain Industrial Installations."[107]

Authority to implement these laws to protect occupational health by means of regulatory enactments has been delegated to various federal offices, such as the Ministry of Labor and the Office for Occupational Safety Policy; and also to various organizations such as the Berufsgenossenshaften (BG), which provide occupational insurance to cover worker accident and disease claims and conduct inspections of workplaces. The BG regulations are designed to prevent diseases, and are based on detailed information on working conditions, under authority provided by worker insurance laws which date back to the nineteenth century.[108]

Ministry of Labor regulations and other actions on toxic substances in the workplace are based on exposure limits recommended by an important independent expert group DFG, the German Science Foundation (Deutsche Forschungsgemeinschaft), on the basis of science, not feasibility; industry-set, feasible regulations for disease prevention of the BG; research findings and expert advice from the Federal Institute for Occupational Safety and Accident Research (BAU) of the Labor Ministry; and recommended exposure standards from a Special Committee for Hazardous Substances in the Workplace (AGA), which has been focussing on carcinogens, and whose membership includes representatives of unions, industry and government. This bureaucratic labryinth for dealing with occupational health hazards functions alongside an equally complex system for controlling industrial chemicals in commerce; with both systems essentially run by technical experts, with little public involvement.[109]

Carcinogens are now receiving considerable attention from the AGA, and BG; with BG actions taken thusfar on general requirements for handling

carcinogens in the workplace, and on specific substances such as vinyl chloride and asbestos.[110] DFG provides the main scientific thrust on carcinogens and other toxics, and sets "maximum concentration values" (MAKS) for chemicals in workplace air, "which, according to current knowledge, generally [do] not impair the health of the employee nor cause undue annoyance." It is now turning its attention to mutagens and teratogens, and the outcomes will be significant.[111]

MAK values set by DFG are extremely important scientific inputs for both the German and EC efforts in protecting worker health, and are reviewed by DFG annually in light of new scientific findings. After DFG ratification, they are published and the various organizations discussed above are given official notice of the new or changed values. DFG recommends supervision of MAK values by ambient (air) monitoring, in conjunction with medical surveillance and biological monitoring of exposed individuals, with blood and urine samples serving as the usual test materials.[112]

In its 1982 official report, the DFG published an extensive list of MAK values for specific substances,[113] but drew special attention to its limitations for certain reproductive hazards in a statement on "MAK Values and Pregnancy."

> "....the unconditional adoption of MAK values as guidelines during pregnancy is not possible because adherence to these values does not guarantee, in every case, that the unborn child is reliably protected from the teratogenic effects of workplace substances. In its broadest sense, the term "teratogenic effects" is understood ... to include any alteration from the physiological norm in the development of the organism which leads either to pre- or post-natal death, to retarded growth or to anatomical or functional damage. Numerous occupational chemicals have not yet been investigated or sufficiently tested for teratogenic effects. The correctly available animal... studies....

> were not only carried out with diverse methods, but also with varying degrees of throughness. It is usually not safe to justify or quantify a teratogenic risk for man on the basis of these studies because in the individual case, the risk for a human can exist even if animal tests are negative or if the dose is significantly lower than the threshhold dose as determined in animal experimentation.
>
> The Commission intends to test those health hazardous occupational chemicals already included in the MAK list to determine whether a teratogenic risk can be excluded by adherence to MAK values, whether such a risk has been reliably proved, or if it must be assumed as probable... For a number of compounds in the work area it will not be possible, for the time-being, to make a statement concerning the teratogenic risk... In the upcoming years, the Commission hopes to create, in a step by step process, a workplace foundation for decisions concerning suitable measures for occupational health protection."[114]

Concern about mutagenic hazards has also been expressed by DFG. Following its two lists of "carcinogenic working materials," those which have been "unequivocally proven" and others which are "justifiably suspected", the DFG cautions that "For a number of carcinogenic and mutagenic chemical compounds, MAK values cannot be established: cancer and mutations become manifest only after years and decades, under certain circumstances in future generations..." It then sets forth various reasons, all scientific, as to why MAK values cannot be set at this time for such substances; and concludes with recommendations for "Technical Guiding Concentrations (TRK's) for such substances. Each TRK is construed as a "directive for necessary protective measures and surveillance." DFG warns that the TRK's are meant to reduce carcinogenic and mutagenic risks, but cannot be relied on to completely eliminate them, and that "attempts must be made to keep .... as much as possible below the TRK values...."[115]

Finally, DFG has initiated a third set of values, Biological Tolerance Values (BAT), for a limited group of substances. BAT's are defined as the "maximum permissable quantity of a chemical compound, its metabolites, or any deviations from the norm of biological parameters induced by these substances in exposed humans." BAT values are thus provided to enable evaluation of the results of periodic biological monitoring and medical surveillance, using the blood, urine, and alveolar air of workers exposed to some nine categories of toxic substances. DFG provides that substances posing a carcinogenic risk have not been assigned BAT values, however, "since at present no biological value which can be regarded as safe can be specified." The BAT value for one of the nine substances, lead in blood and in urine, is divided into separate values for men (e.g., "70 mg. Pb/dl") and for women under the age of forty-five (e.g., "45 mg. Pb/dl").[116]

Thus, increased attention is now being given to carcinogens and research momentum is now developing on mutagens and teratogens, within the elaborate West German framework for protecting occupational health. With the possible exception of developments in the United States and at the World Health Organization, the West German findings will be of most significance to the reproductive health of workers in western industrial nations. As discussed earlier, the significance of German findings arises from their strong scientific basis (e.g., the DFG) the aggressive role of its strong chemical industry in protecting its export markets by promoting uniformity on an international level, and German leadership on chemical control developments in the EC, OECD, and other international ogranizations.

But strong science also means increased reliance on new diagnostic techniques for biological monitoring and medical surveillance to detect and contain reproductive hazards, and increases the potential for differential worker health regulations on the basis of sex and age. This potential, suppressed in the EC lead standard discussed earlier, has now appeared in Germany in the form of the DFG's differential BAT's for lead in the blood and urine of male and female workers. Whether differential requirements established by experts, who are more dominant in German occupational health than in the EC or US systems, will be replaced by a uniform single requirement approach is a critical issue.

German law guaranteeing equal treatment of workers will therefore be a key factor. But German law for equal treatment appears to be as limited as EC law, previously discussed. On the one hand, there is law which bans all forms of sex discrimination by an employer in matters of hiring, working conditions, pay and job termination in Germany;[117] consistent with EC Directives.[118] On the other hand, the EC Directives have had limited effect on occupational health matters as discussed earlier; and this may lead to similar weaknesses in non-discrimination laws and policies in the EC-member states, such as West Germany, because support for non-discrimination laws in the member states was premised in part on the need for consistency with EC enactments. Further, early German measures to protect the health of pregnant women from the rigors of strenuous work, shift work, and assembly line work by removal from the workplace[119] have recently been extended to all other occupational contexts which contain hazards.

Differential treatment of women workers exposed to toxic substances which may pose reproductive hazards can most clearly be seen in the Maternity Protection Act of 1979.[120] This law is designed to reduce various reproductive risks to an "expectant or nursing mother" by various means. Some of these are simple measures pertaining to the arrangement of machinery, and providing a "seat to enable her to take short rests", with restroom facilities, and with the opportunity to interrupt "work for short periods."[121]

But other measures are far-reaching in their protective but discriminatory impact. For example, the law provides that "no expectant mother shall be employed on heavy manual work or work exposing her to the harmful effects of dust, gases, vapors, heat, cold, damp, vibration or noise... [or] on work in which she may contract occupational diseases, as defined in ... the accident insurance scheme [which applies] to such diseases, in so far as she is particularly exposed... by reason of her pregnancy."[122]

Other job exclusions are mandated "until eight weeks after confinement... [or] twelve weeks in the case of premature and multiple births," and for nursing mothers; and expectant and nursing mothers are excluded from overtime work under specified circumstances. Maternity leave, "nursing time" away from the job, and cash benefits are mandated, along with compensation duties for the employer.[123]

This detailed law also makes it "lawful for an employer to give a woman notice of dismissal during her pregnancy or until four months after confinement... but no employer shall give [such] notice... while she is on maternity leave or until two months after it has ended."[124] Finally, full discretion is granted to the "medical practitioner" to exclude an expectant

mother from employment upon a finding that "her life or health or the life or health of her child would be endangered by her continuing the employment"; and in any case, an expectant mother shall not be employed "during the last six weeks preceding her confinement unless she expressly states that she is prepared to work..."[125]

Thus, maternity protection law provides for protection of reproductive health by means of discriminatory measures; and essentially vitiates other German law which sets forth abstract principles for the equal treatment of men and women at the workplace. Recent amendments to equal treatment law provide that maternity protection measures should be given priority, in the event of conflicts between the two sets of laws: "differential treatment on account of a worker's sex shall be permitted in so far as... action pertains to the nature of the activity that the worker is to carry on... the employer shall bear the onus of proving material reasons unrelated to a particular sex to justify differential treatment..."[126]

Although the German Basic Law provides, among its "basic rights", that "men and women shall have equal rights" and "no one shall be prejudiced... because of his sex,"[127] the statutes discussed set forth various legally-permitted forms of discrimination against women which will prevail as German agencies and legislation deal with reproductive hazards to workers. Health standards will therefore permissably incorporate differential protective requirements. These standards are virtually impregnable to challenge on factual grounds, given their scientific strength and the limited opportunities for judicial review of the standards on their merits that are afforded by German law.

Those adversely affected (e.g., women) are essentially left to seek judical review on the basis that their fundamental rights have been infringed, such as their rights under the Basic Law to equal treatment, privacy, respect of human dignity, and integrity of the body against medical or biological test requirements. None of these rights are absolute, and their limits will be determined in litigation.[128] Finally, as discussed earlier, future German studies and standards on reproductive hazards will have considerable influence on developments in the EC and its member nations.

D. Sweden

Sweden has a strong program for the protection of occupational health which is markedly different in its institutional structure and processes from programs in the United States and West Germany. This is based in part on Sweden's historical independence from other Western developments, without the war experience, destruction, reconstruction, or EC membership of West Germany and other European nations; and in part, it is based on Sweden's liberal political traditions, and reliance on cooperation between unions and management in industry as well as on expertise in occupational medicine.[129]

Today, various laws and regulations in the fields of labor, health, environmental protection and data protection form the legal basis for Swedish occupational health programs. These laws and regulations are influenced by several political and economic forces, ranging from the "industrial democracy" movement in which workers have been given an increasing role in corporate decision-making and ownership, to the recent decline in the traditionally strong Swedish economy, in which over 90 percent of Swedish industry is privately owned.[130] Today, Sweden is recognized as the "path-breaker" in occupational health matters among all industrial nations, with a system which "relies heavily upon informed and active participation by workers at both local and national levels", and in which "Swedish management is accomodating... and legal challenges to new standards are rare."[131]

Swedish regulators "rely heavily upon American scientific research, particularly for Threshhold Limit Values (TLV's) and NIOSH-recommended standards, to provide benchmarks for chronic hazards; and upon Western Europe, particularly West Germany, for accident benchmarks." They also rely on

several unique means for implementation of standards and other health protective measures, including union-organized "study circles"; and the safety ombudsman system (skyddsombud) in which each workplace with five or more workers is required to have one or more safety ombudsmen, who are elected by fellow workers; and who are authorized to inspect, supervise safety and even stop or suspend certain work on health and accident grounds, until offical determinations are made. The results are not conclusive enough to use for comparative purposes, but Sweden's industry-wide fatality rate of 0.86 per 10,000 workers is lower than the U.S. rate of 1.3 per 10,000.[132]

A thoughtful analysis of the Swedish system concluded that, in Sweden, "workers have greater knowledge of risks than publics and accordingly, workplace risks are voluntary (i.e., show greater consent by the risk-bearer). The Swedish approach... begins with the implicit presupposition that consent is probably not achievable, however extensive the worker understanding of risk, because workers are not free, nor should they be required to choose between riskier and safer jobs... that responsibility exists to narrow continuously the gap in sectors of hazards in a persons' life; that workers acting on their own behalf are the most powerful force in stimulating that progress; and that the fundamental value underlying worker effectiveness is autonomy."[133]

The Swedish legal framework is provided primarily by the Working Environment Act, which became effective on January 1, 1978; and which provides in general terms, various objectives, powers and procedures, and authorizes the issuance of specific standards and other regulations by the National Board of Occupational Safety and Health (NBOSH).[134] The regulatory

process does not demand notice, comment and hearing opportunities as in the United States, but follows four steps: (1) NBOSH establishment of a committee of union,business and other representatives to draft a regulation, and which meets "neither in secret nor in public"; (2) issuance of the draft regulation to interested parties, agencies and selected persons, for comment ("remiss"); (3) assimilation of their responses into a draft final regulation; (4) NBOSH promulgation of the final regulaion, with no right of judicial review for challenging the regulation,[135] nor opportunity for challenge on constitutional grounds.[136] Nevertheless, dispute resolution procedures are available within the administrative structure, in criminal proceedings in regular courts, in civil proceedings in the labor court, and by means of arbitration.[137]

Six aspects of the Swedish program of occupational health regulation have been identified as its key features. These include "lack of employer opposition", "worker education and consciousness", "the system of safety stewards and committees" at each workplace (e.g., 282 safety stewards and forty-five safety committees at one steel mill with 4800 employees), "democracy at the workplace' wherein each employee is encouraged to achieve work which is "a meaningful and enriching part of life", high quality company health services which have a risk-prevention approach, and the "total work environment" concept which includes "psychological and sociological factors" which are deemed interrelated with overall health, since "there can be psychological effects resulting from a job injury that have physical causes, and there can be physical effects resulting from psychological and sociological problems at work.[138]

The Act provides a broad framework for NBOSH regulations, but its requirements are couched in general terms. Thus, "substances liable to cause ill health... may only be used in conditions affording adequate security", employers and employees must cooperate "to establish a good working environment", and of considerable relevance to problems of reproductive risk, NBOSH "may prohibit the use of employees for... work" which "entails a special risk to certain groups of employees" or for which a "medical examination has shown... a disease or debility rendering [the worker] particularly susceptible to such risk."[139]

A special interpretation of the statute, by the Swedish Ministry of Labor, provides that this latter section replaces prior statutory provisions on "the use of women at work", but that "special risks [which] may occur during pregnancy are still covered by this section, and by the Act's authorization of NBOSH to prohibit "certain risk groups for work", and to "stipulate medical checks for the employees concerned." Further, "a mother may not be denied time off for the purpose of nursing her child", and a "safety delegate may order the suspension of work on [a]... jobpending a decision by the Labor Inspectorate" if the job "involves immediate and serious danger... and if no immediate remedy can be obtained..."[140] Other sections of the Act provide for action-forcing by means of inspections, administrative procedures and liability; and deal with the need for work design to ensure job satisfaction.

However, the Act does not expressly deal with carcinogenicity, mutagenicity, teratogenicity, reproductive risks; nor does it expressly identify women of childbearing age or pregnant women as deserving of any special regulatory or other protections. This silence is important, because the new Act, as noted

earlier replaced various prior laws, some of which restricted the employment of women from certain jobs because of special hazards.[141]

NBOSH's activities have led to several regulations, which have been criticized on grounds of inadequate stringency, and vagueness in compliance requirements and sanctions. NBOSH has also been criticized for failure to regulate various other occupational health problems.[142] Further, there is considerable uncertainty as to how or whether economic factors are to be included in regulatory decision-making, although it is believed that some form of a cost-benefit or balancing analysis occurs at various points in the NBOSH decision-making process.[143] Among NBOSH's actions have been the promulgation of a regulation prescribing limit values for various atmospheric pollutants including carcinogens and lead, in the workplace;[144] and conduct of research, including a new investigation of the relationship between fetus malformation and video-display terminal work, for example.[145]

The lead regulation enacted by NBOSH provides for the same biological expsure limits for men and women, contrary to the recommendations of WHO and other expert groups which recommended differential limits, and which had been considered by the Swedish agency. One reason cited by NBOSH was that damages occur at lower blood lead and ambient air levels of exposure, than had been assumed previously. Thus, WHO recommendations that blood lead levels not exceed 2.0 mmol/1 for males, and 1.5 mmol/1 for females during reproductive years were rejected by NBOSH. Instead, NBOSH set forth a uniform, three-tiered approach: investigation at 2.0 mmol/1, removal from work if a level of 2.5 mmol.1 is exceeded three times in one year; and immediate interruption of exposure at work at 3.0 mmol/1. NBOSH also

provides for informing women about lead exposure hazards, and has introduced "a total ban on lead work for pregnant women and nursing mothers."[146]

The accompanying NBOSH "Consensus Report for Inorganic Lead" set forth further justifications for the regulation including research results on decreased fertility of male test animals, increased perinatal mortality in animal offspring, sperm damage in male workers and increased frequency of abortion of their female partners. Lead passage through the placenta, lead presence in the umbilical cord and milk, embryo resorptions in test animals, reduced weight and birth defects in offspring, developmental disturbances, abortion-inducing effects, and pre-natal damage, were also cited. Genotoxic effects in the form of chromosome damage, and the probability of foetal damage if exposure is terminated as soon as pregancy is discovered, were also evaluated.[147]

Further regulatory actions will undoubtedly be taken by NBOSH on reproductive risks, since it is influenced by recent findings of reproductive risks in the Swedish research community, at NIOSH in the United States, in other nations and international organizations. For example, recent findings at the Bolliden A.B. smelting plant at Ronnskar indicate that chromosome damage has occured in the white blood cells of workers exposed to lead and arsenic, and that pregnancies have had negative outcomes, and these findings have stimulated demands for action.[148]

However, it is clear that any clinical, biological, epidemiological or other findings by NBOSH that tend to promote differential protective requirements for men and women will face a well-entrenched apparatus or system for promoting equal treatment of all workers, in the implementation of NBOSH

requirements. The system is one which is well grounded in other Swedish laws, and well implemented by the Swedish Trade Union Confederation.

The system for promoting equal treatment arises from Swedish laws which structure union and worker participation in management decision-proceses, and which establish substantive principles for equal treatment. Thus, Swedish laws provide for trade union representatives to sit on the boards of joint stock companies, for stewards to wield various powers to protect the health and various rights of workers, for restricting the termination of employees except on certain explicit justifications, and most importantly, for "co-determination" through union rights to negotiate on all issues and to secure information on all issues. Other laws promote employment opportunities for persons with various work impediments and equal pay for men and women for work of equal value.[149]

The Swedish Trade Union Confederation has aggressively pursued the opportunities and rights afforded by these laws, and it has developed initiatives, such as its new program of "trade union social work" to give various forms of support to its members, in the workplace.[150] Of most relevance to reproductive hazards, it has established an agenda of activities to protect the rights and expand the job opportunities of women as well as youth and the handicapped.[151] The very lengthy agenda for ensuring women's rights and opportunities includes activities which will bring influence to bear on local, county, and other authorities to ensure that any existing obstacles to gainful employment for women are removed", to "adjust work to the worker: so that the job does not impose "excessive physical and psychological demands", and to investigate workplaces with "a record of large

numbers of workers proving unfit for employment and being squeezed out."[152] A second agenda of union activities for promoting equality includes a model for establishing an "equality group" at the plant level to work against all discriminatory features of an employer's operations and decision processes.[153]

Thus, a lengthy agenda has been established for union activities to remove discrimination, largely at individual firms. Although the agenda does not expressly provide for actions to deal with reproductive risks to worker health and their discriminatory consequences, it is clear that the overall thrust is to achieve equality by fitting the job to the worker, not the worker to the job. Given the structure and societal support for putting this principle into practice, it is clear that reproductive health requirements which discriminate will face considerable obstacles when their implementation is sought at the specific worksite. The contrast with West Germany, where technical expertise dominates, is apparent.

E. International Organizations

1. Public Organizations

Three international public organizations deal with worker health and chemical control issues in a responsible and influential manner. These are the International Labour Organization (ILO), the World Health Organization (WHO), with its affiliated research laboratories, and the Organization for Economic Cooperation and Development (OECD).

Each operates on a highly structured basis in setting its agendas of activities, in responding to demands from its governing bodies for specific actions, and in responding to various unofficial pressures. Each uses staff experts, researchers and consultants, and committees of technical experts or otherwise qualified persons from various member countries in developing the factual basis for ultimate determinations; and operates in a manner which in some cases deliberately excludes public involvement, but in most cases simply does not invite it.

Each organization seeks to achieve its final determinations on a particular health problem; for example, by means of expert committee deliberations and consensus on scientific and other factual issues pertaining to health, with economic and political factors not explicitly addressed nor officially recognized in the usual case, but nevertheless present throughout deliberations as strong underlying forces. Finally, the factual findings

and other outcomes usually do not have binding legal effect on their member nations, but tend to promote uniformity of health requirements among all nations, members and non-members, since the outcomes have been developed on the basis of expert deliberations and are thereby accorded considerable respect.

Thus, it is left to each nation, member and non-member to reach their own legally-enforceable decisions on specific health problems after one of these organizations has reached certain factual findings. To do this, the national government will typically assess or verify the factual findings generated by the international organization, factor in its own technical information and analytic approach, consider its own economic and political variables, and determine the content of any enforceable requirements en route to reaching its own legally-enforceable decision by means of its own prescribed procedures.

Certain countries now play key roles in providing members for the expert committees, with the United States, West Germany and Sweden being heavily represented. This tends to promote factual findings by international organizations that are not too different from what these countries are currently capable of enacting. On the other hand, the "third world" countries tend to dominate the WHO and ILO on socio-economic and public policy matters, and prospective actions which will require a fusion of western industrial factual information with "third-world" socio-economic assumptions and policies are particularly troublesome and difficult to achieve.

The International Labour Organization (ILO) has promulgated conventions and resolutions which set forth broad principles, and has set international "standards" for specific problems since 1921; for example, for white lead exposure to painters, for compensation for occupational diseases, for occupational health services, for radiation protection, for noise, for workplace air pollutants, and for asbestos and occupational carcinogens. In its benzene standard, ILO called for substitution where possible, medical supervision, labelling, worker information, and a maximum exposure value. Since 1974, ILO has grappled with occupational carcinogens and enacted a Convention, committee reports and recommendations on the subject.[154] But it has not directly addressed reproductive risks to date.

In its 1959 Official Recommendation on Occupational Health Services, ILO set forth broad principles for preventative health service functions, including the use of pre-employment and on-the-job biological and medical monitoring to "ensure particular surveillance over certain classes of workers, such as women...";[155] but several subsequent broad enactments of similar general content have not singled out women for special surveillance or action.[156]

ILO reports and surveys occasionally deal with reproductive risks and differential treatment of women. In a 1975 report on the health problems of migrant workers, jointly issued with the World Health Organization, the ILO Committee found migrant female workers to be particularly unskilled and ignorant of health problems, and recommended that "migrant females especially

should be provided with health and social protection...occupational health could be adapted to play a dominant role in this situation"; along with recommendations for medical examinations and surveillance coordination with home countries, reunification of families, and the use of "medical-social cards" to store information of a social, family and health nature.[157]

But over the last decade, ILO has not engaged in setting standards for specific hazards or risk categories, nor in addressing the "equal treatment" issue. Instead, it has relied on WHO for technical studies, and issued several reports which seek to educate under-developed nations as to the organization of occupational health services, labor dispute resolution systems, medical diagnostic and biological monitoring techniques and other general features of systems for protecting workers' health that are already found in the United States and Europe.[158] Thus, it does not represent a force for resolving the reproductive risk and differential treatment problems facing workers in industrial nations.

The World Health Organization is a technical counterpart to the ILO, in that it serves many needs of developing nations. But WHO is also of considerable importance to industrial nations because of its highly-regarded technical studies and findings on matters involving industrial and chemical hazards to human health. Whereas, ILO has largely dealt with employment and social policy, labor institutions and occupational health services in general, WHO has undertaken the development of findings of

fact regarding chemical hazards and protective measures for worker and environmental protection. It has also published various reports on the conduct of occupational health programs, with strong emphasis on use of monitoring methods, including ambient, statistical, and biological and other forms of human monitoring.[159]

WHO has developed four "standards," thus far, to control workplace exposures, including a lead standard which provides for differential protective requirements for men and women, and a cadmium standard. It has also issued a series of reports with findings and recommendations for occupational exposure limits to various chemical, physical and radiological agents. The recommendations are derived from findings made by special committees of technical experts convened by WHO's Office of Occupational Health; and the reports are among the most lucid and factually complete studies available anywhere on the agents studied. Each report deals in sequence with several issues: the attributes or hazard properties of the particular agent, metabolism, exposure assessment, animal and human health effects, relationships between exposures and effects, conclusions on occupational exposure limits, recommendations, future research possibilities, and reference materials. Because of their completeness and high quality, these reports are valuable to decision-makers, even in the most technically-sophisticated nations. Although they lack legal force in a direct sense, they are relied on as evidence in proceedings in agencies and courts to support certain protective measures, and to oppose inadequate regulations and harmful

activities. Many of the findings deal with reproductive risks.

Its report on occupational exposure to pesticides, for example, demonstrates WHO Committee interest in identifying and measuring mutagenic and teratogenic hazards, among other health effects.[160] Thus, the health effects of Malathion are discussed, to some extent, in terms of potential mutagenic and teratogenic hazards; based on various reported studies, including those of submammalian test systems and in vitro cell cultures, and various reports on human health effects. Several conclusions were reached, including one that, "Knowledge of the mutagenic and/or carcinogenic effects...is limited. Experimental epidemiological studies to detect the DNA damaging potential...should be initiated as soon as possible."[161] For carbaryl, "long-term effects on ...reproductive...function [has]...not been reported in man," but teratogenic effects were reported in some animal studies, and the Committee recommended research to establish "threshhold concentrations for embryotoxic, gonadotropic, and teratogenic effects of carbaryl in inhalation experiments on animals."[162]

This same report also dealt with lindane, and considered animal tests involving lindane exposure which indicated reproductive effects, and other research which had concluded that lindane passes through the placenta and is excreted in mother's milk. The Committee concluded that it found it impossible to consider the feasibility of a special recommendation for female workers, but that there is "a need for long-term animal studies...in regard

to reproduction."[163] Finally, with regard to DNOC, the Committee evaluated reports of reproductive effects, gonadotropic and embryotoxic, in animals and numerous findings as to human health effects; and concluded with another recommendation for reproductive effects research, which would take various factors, including sex and pregnancy, into account.[164] Thus, WHO's expert Committee paid particular attention to the reported reproductive effects of several pesticides in animals and humans, recommended exposure limits without differentiating between male and female workers, but urged further research and monitoring methods which have great potential for promoting subsequent differential requirements.

Other WHO reports in this important series demonstrate that other expert committees have also placed considerable importance on the need to assess any reported findings of reproductive effects in animals and humans; and have similarly emphasized the need for research on reproductive effects. For example, in its report on organic solvents,[165] the expert committee carefully evaluated reported reproductive and other hazards associated with exposure to four solvents, including associations between toluene exposure and menstrual dysfunction and uterine prolapse; between xylene exposure and teratogenic effects on test animals; between carbon disulfide exposure and embryotoxic effects in animal studies; and between trichloroethylene and teratogenic effects in test animals. As with pesticides, the solvents report's findings and recommendations do not contain differential features on the basis of sex, due to the inconclusiveness of the available

database; but, once again, strong emphasis is placed on the need for further research and human monitoring and surveillance with regard to potential reproductive hazards.[166]

Of particular interest is the WHO report on occupational exposure to heavy metals.[167] Among the premises adopted by the expert committee in this study is one that the protection of workers from the health effects of heavy metals "should be primaril based on exposure-response data...the aim is not to protect the fictitious 'average worker,' but those who are most sensitive to exposure."[168] This is reinforced by another premise that "occupational exposure limits should protect the health not only of the worker, but also of their families...The occurrence of harmful effects on reproductive function in males and females (gonadotoxic effects), on the development of the fetus (embryo-toxic effects), on the production of malformations or deviations from normal structure in offspring (teratogenic effects) and on the post-natal development and health of offspring of male or female workers needs to be studied urgently."[169]

Numerous research findings as to reproductive effects of heavy metals were evaluated, including those which dealt with cadmium and its possible linkage to prostate cancer;[170] manganese and possible chromosome abnormalities in the bone marrow cells of test animals and in DNA synthesis in in vitro studies, as well as disturbances of animal sexual function and germinal activity;[171] inorganic mercury and possible chromosome breaks and fetotoxic effects which require "exposure of women of child-bearing age...

[to be] as low as possible." The mercury assessment led to a recommendation for a double standard: one for male workers (25 ug/m^3, air; 50 ug/g creatinine), and one for women in reproductive years (as far below the male limits as possible).[172]

As for inorganic lead, the committee specified differential standards after an extensive review of available research reports, which indicated that lead crosses the placenta, as well as poses other reproductive hazards to both women and men. However the hazards to men, which include asthenospermia, hypospermia, and teratospermia, were determined to lack dose-related data for low level exposures, and the Committee concluded that "these effects cannot yet be considered in the recommendation of health-based limits.[173]

But fetotoxic effects were considered ripe for recommendation:

> ...one should consider the differences in sensitivity between males and females with respect to effects on the haem synthesis, and, in addition, the special considerations that arise from the demand to protect the offspring and females in the fertile age range.
>
> Taking into account the insufficiently confirmed data on the minimum-adverse-effect level for the nervous system, a health-based biological exposure limit for Pb-B of 400 ug/l is recommended for males and for females over the reproductive age. This limit is based on the adverse effects of lead on the haematopoietic and peripheral nervous system at the Pb-B range of 400-600 ug/l.
>
> The Pb-B level of females in the reproductive age range should be kept as low as possible and, to protect the fetus, should not exceed 300 ug/l. This level will also prevent significant effects on haem synthesis. In practice this recommendation may imply restrictions for women of child-bearing age to work in areas where exposure may cause Pb-B levels to exceed the 300 ug/l limit.[174]

As discussed earlier, this differential approach was rejected by the EC and Sweden, which established uniform standards for all workers, but for which Sweden also prescribed job exclusion for pregnant females. WHO's differentiation was based on its finding that:

> The available data show that females and children are more sensitive than males to the toxic effects of lead on haem synthesis, at least with regard to inhibition of ferro-chelatase, which results in an increased accumulation of PP in erythrocytes. These observations suggest that, for full protection, females require a lower health-based occupational exposure limit for Pb-B than males. Furthermore, in pregnant women protection of the developing embryo from injury to the central nervous system due to lead exposure is an important point to be considered. Because lead passes the placenta, and because placental blood has a Pb-B concentration proportional to maternal blood, there is no doubt that the fetus is exposed to much the same concentration of lead as the mother. Although no direct evidence is available on the effects of prenatal lead exposure on the CNS function in humans, it can be deduced that the developing brain is probably more vulnerable to the toxic actions of lead than the mature brain. Animal experiments also support this assumption.
>
> Because it is not known how early in the course of the pregnancy CNS damage can be caused by lead, and because elevated levels of lead in tissues persist for several months after the cessation of exposure, one cannot rely on self-reporting of pregnancies at an early stage to be effective in protecting the fetus. The only alternative is to apply more stringent health criteria for females in the fertile age, i.e., below 45-50 years, than for other categories of workers.[175]

Thus WHO proceeds on the basis of medicine, biology, toxicology, epidemiology and other relevant disciplines to carefully examine the reproductive hazards of numerous substances in the workplace; but apparently remains immune to social policies for equal treatment of workers. No other organization, including NIOSH in the U.S. and its West German (DFG) and Swedish (NBOSH) counterparts, has addressed reproductive hazards to workers as

systematically as WHO; and WHO's future influence on legal developments in both industrial and "third world" nations on the control of such hazards in the workplace will be considerable, because of its uniqueness in this respect, and also because of the scope, quality and objectivity of its deliberative process.

A similar series of WHO reports establish "Environmental Health Criteria" for various substances, including petroleum products, nitrates and nitrites, noise, radio frequency and microwaves, and lead.[176] They arise from expert, deliberative processes similar to those discussed for occupational health criteria, and are managed by WHO's Environmental Programme and its International Program on Chemical Safety (IPCS). IPCS is staffed by highly-qualified experts, who are promoting the biological basis for reaching environmental health criteria; and like their counterparts in occupational health, they remain apparently immune to social policy for equal treatment. One of the most recent IPCS reports, on Selected Petroleum Products, for example, provides that "Possible susceptible groups, and factors such as age, sex, state of health, and genetic background should also be taken into consideration."[177]

Nevertheless, the IPCS reached some conclusions on lead effects in the general population which militate against setting differential criteria:

Reproduction

> There is no epidemiological evidence of an effect of lead on the fertility of women or on *in utero* fetal development, but there are numerous reports in the older literature of stillbirths and miscarriages among women working in the lead trade (Cantarow & Trumper, 1944; Oliver, 1914). These reports probably contributed to the promulgation of legislation forbidding the employment of women in the lead trades in many countries. Panova (1972) reported that women working in lead industries had a higher incidence, compared with a control group, of ovulatory dysfunction--mainly anovulatory cycles and cycles with luteal abnormality. A relationship was reported between ALA-U and the incidence of anovulatory cycles. The effect was seen at 8-10mg ALA/litre of urine.
>
> There are not any reliable data to indicate that infertility in women results from exposure of the male partner to lead.
>
> Some of the early reports on lead poisoning (Oliver, 1914) suggested that reproductive failures such as sterility and miscarriages occurred even among the non-working wives of industrially-exposed men. The reproductive capability of 150 occupationally exposed men was recently studied by Lancranjan *et al.* (1975). The results indicated that both lead poisoning and moderately increased lead absorption decreased the fertility of men. An increased frequency of asthenospermia, hypospermia, and teratospermia was found. No interference with the hypothalamopituitary axis was demonstrated; thus, hypofertility was thought to be due to the toxic effect of lead on the gonads.178

Teratogenicity

> There is practically no information in the literature to suggest that lead is teratogenic for man (Wilson, 1973). Only one case has been reported of neuromuscular abnormalities and failure to grow in a child attributed to lead poisoning as a result of the consumption by the pregnant mother of illicit whisky (Palmisano et al., 1969).[179]

And, accordingly, IPCS did not prescribe differential protection levels.

Because reproductive risks have so clearly emerged as an important area for future emphasis, WHO's Occupational Health Office has convened a special committee to develop an overview report on "Occupational Hazards to Reproductive Health." Experts from the United Kingdom, the United States and Finland are drafting chapters on assessment of reproductive hazards, outcomes of exposure, specific agents, exposure limits, and control measures. Publication is expected in 1984, and its significance to occupational health officials in many countries can be expected to be considerable.[180]

Three additional developments at WHO, in addition to the forthcoming overview report, indicate that activities and findings on reproductive hazards will intensify. One is WHO's growing reliance on its affiliated research laboratories for technical support, particularly the International Agency for Research on Cancer (IARC). IARC is conducting several research projects on carcinogenicity and mutagenicity, and has collected various reports of research done elsewhere on reproductive hazards,

and therefore provides additional high-quality technical expertise in response to WHO needs.[181]

A second development is WHO's growing emphasis on "worker well-being" and all that this term signifies, namely a holistic concept of worker well-being which encompasses the impacts of physical, chemical and biological agents on workers, the influence of psychosocial factors, and various other physiological and psychological aspects of work. In light of this complex matrix of factors which determine worker well-being, WHO has proposed a variety of research initiatives, control strategies, and an overall philosophy which emphasizes that occupational health can best be promoted by "treating the source (the employer's workplace) not the symptoms"; and by increasing the role of behavorial and psychological experts in occupational health services. Thus, the framework proposed by WHO encompasses reproductive impairments which may arise from stress and other psychological factors, some of which arise from external conditions beyond the workplace, and future research and recommendations on these aspects of workers well-being as they relate to reproductive functions can be anticipated.[182]

The third development is WHO's acceptance and preference for biological and medical monitoring and surveillance as preferred monitoring methods, because of their growing accuracy and yielding of worker-particularized results. This is clearly reflected in the WHO reports, discussed earlier, each of which contains recommendations for the immediate use of such techniques. This emphasis is now being applied to reproductive hazards.[183]

Finally, WHO acts as a clearinghouse for information on health developments and legislation in all nations; and therefore tends to promote new interests, research activities and even legislative developments in many countries. For example, a recent WHO report indicates that new legislation for worker health in several countries expressly requires standards which will prevent health impairment in the worker's offspring.

> The basic objectives in establishing occupational exposure limits are very similar for the USA, the USSR, and other countries. The U.S. Occupational Safety and Health Act of 1970 (P.L. 91-596, 1970) states that exposure limits are needed in order to insure that no employee will suffer impaired health or diminished life expentancy as the result of his work experience. In the USSR, the occupational exposure limit is that level of exposure which in the case of daily exposure at work (excluding rest days) for 8 hours, or some other duration but not totalling more than 41 hours a week, will not cause in the individual any disease or disorder from a normal state of health, detectable by current methods of investigation, during his working life, or during his entire lifetime, or in any of his descendants (Gosudarstvennyi Standart Soyuza SSR (12. 1.005-76), Moscow, State Committee for Standards, 1976)). It should be noted that recently the USSR and a few other countries have included prevention of health impairment in the offspring as a criterion in determining exposure limits.*

Thus, WHO's communication role, in this case, raises the issue of whether the U.S. OSHAct should be similarly amended to provide an explicit mandate for standards which will protect reproductive health.

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*From Recommended Health-Based Limits in Occupational Exposure to Heavy Metals, WHO Study Group Report, Technical Report Series No. 647, World Health Organization, Geneva (1980), p.9.

The Organization for Economic Cooperation and Development is a voluntary organization whose members include 24 industrial nations in Western Europe, North America (the United States, Canada), and the Pacific region (Australia, Japan). It's chief concern is the harmonization of trade, economic and industrial policies, in general, and the removal of non-tariff trade barriers, in particular. Thus, it has focussed on chemical controls and occupational health only insofar as the development of uniform policies on these matters promotes its economic policy objectives. To this end, it has published economic, legal and technical reports, and testing guidelines for chemicals; and has enacted various resolutions which then are considered by its member nations for possible adoption as legally enforceable requirements.

OECD's Chemicals Group has appointed a small study committee on reproductive risks from chemicals, and the committee has met in private, but published no agendas or reports to date.[184] However, the Chemicals Group, with the active involvement of the U.S. Environmental Protection Agency, has enacted a comprehensive set of Test Guidelines for chemicals in commerce. The Guidelines are consistent with the requirements of the American Toxic Substance Control Act and the EC's Sixth Amendment; and represent a major initiative by OECD to harmonize the laws on chemical testing of all major western industrial countries. Although OECD lacks the technical expertise of WHO, it was chosen to develop the testing requirements by officials in the United States and other member nations, because these nations include most of the major

industrial producers and traders in chemicals, and they had confidence in OECD's sensitivity to trade and other economic considerations.[185]

The substantial achievements of OECD in harmonizing the TSCA and EC Sixth Amendment approaches to notifications, minimum pre-marketing data requirements and other aspects of chemical control led to a renewal of the Chemicals Group's mandate, and its recent activities have focussed on problems of confidentiality and the exchange of information, subjects where lack of uniformity is also believed to create trade barriers.[186]

OECD's Guidelines for Testing of Chemicals have been officially endorsed by its member nations, and are therefore to be "consulted" whenever "testing of chemicals is contemplated," since "their use in the generation of data provides a common basis for the acceptance of data internationally, together with the opportunity to reduce direct and indirect costs to governments and industry associated with testing and assessment of chemicals."[187] Other OECD actions have been taken to assure that "data generated in one country in accordance with the OECD Test Guidelines--and additionally in accordance with OECD Principles of Good Laboratory Practice--should be accepted in OECD countries for purposes of assessment and other uses relating to protection of man and the environment."[188]

Thus, although developed for purposes of removel of trade barriers and test cost containment, the Guidelines today serve

as an important set of principles which are being applied in industrial nations, and which are used to help determine levels of protection for environmental and occupational health, including levels of reproductive hazards. They contain detailed sections on "physical-chemical properties, effects on biotic systems, degradation and accumulation, and health effects," and are subject to ongoing revision.[189]

The "Health Effects" section of the Guidelines deals with toxicity testing, including animal and in vitro tests and their extrapolation to humans, and the generation of "results that will be fully acceptable to various regulatory bodies." The section, like others in the OECD Guidelines, therefore is based on considerations of scientific and regulatory acceptability and the avoidance of wasteful duplication to achieve efficiency.[190] Thus, test rules set forth are based on scientific, legal, and economic considerations, and may not prove fully acceptable to those who believe that scientific and health findings should be the exclusive bases for test rules.

Among the toxicity tests set forth in the "Health Effects" section are those for reproductive toxicity:

> Reproductive Toxicity
>
> The term covers the areas of reproduction, fertility and teratogenicity. It has been found that many chemicals can affect fertility and reproduction, often in an insidious manner without other overt signs of toxicity. Fertility can be affected in males and females and effects can range from slightly decreased reproductive capability to complete

> sterility. Teratogenicity deals with the adverse effects of a chemical on the developing embryo and foetus. Reproductive toxicity is important as it has an important bearing on the health of mankind. Testing techniques are developing and the concept of combined tests, covering all aspects of reproductive toxicology, appears promising.[191]

"Other considerations" are set forth for all types of toxicity tests, including "chemical analysis, choice of test animals, animal care, number and size of groups, limit testing, structure-activity relationships, and issues involved."[192] A detailed discussion of teratogenicity testing is then set forth and indicates at the outset that "there are no relevant international standards." It then provides various test method" principles and procedures," the selection and care of test animals, dose levels and other test conditions, pathology considerations, and data and reporting formats.[193] Mutagenicity testing is not accorded a separate section, but is apparently integrated in other detailed sections on "carcinogenicity studies," "chronic toxicity studies" and "combined chronic toxicity/carcinogenicity studies."[194]

Actual use or reliance on these Guidelines in national regulatory actions will vary, depending on the legal and technical requirements for defensible standards which apply in each country. Thus, in the United States, for example, the Guidelines will have variable usefulness to agencies operating under different legal mandates (e.g., EPA, FDA, OSHA, etc.), established test requirements, and pressures for other or additional requirements

by potential litigants (e.g., industry or public interest group challenges). It would, of course, be an interesting exercise to compare the OECD test rules, based on economic as well as scientific and legal considerations, with the test rules implicit in the procedures of organizations which rely primarily on scientific and health considerations, such as NIOSH or WHO.

2. Private Membership Organizations

Numerous private membership organizations, such as trade and professional associations, unions, and large firms such as chemical and oil companies, play influential roles in the development of laws and regulations in the European Community and countries such as West Germany and Sweden. The strength of this influence and its effects cannot be measured by published information, because, as in the United States, such organizations do not seek public oversight or involvement in their activities.[195]

Several private organizations with industrial or corporate memberships are very briefly discussed here, but only on the basis of their publications, and only to the extent the publications demonstrate scientific and other efforts to deal with reproductive hazards. Professional organizations and unions, and various industry-wide considerations, have already been briefly discussed in the prior sections on the EC, West Germany and Sweden.

CONCAWE is one of the major private organizations. It is "the oil companies' European organization for environmental and health protection." Its staff and experts on call from its member firms have produced a number of reports on various matters relating to chemicals safety. These include reports on "health and safety data sheets for petroleum products" and "precautionary labelling of packaged petroleum products," which provide guidance on required and desirable practices for members to follow.[196]

Most of the reports deal with basic engineering approaches to oil facility safety and environmental protection, and only a few have any bearing on occupational health. In dealing with "health aspects of lubricants," one report identifies a scrotal cancer study, for example, enroute to prescribing various precautionary measures.[197] In dealing with "health aspects of bitumins," another report concludes that "there are no toxicological data which relate directly to mutagenic potential...[nor on] teratogenicity/reproductive effects," but makes reference to some relevant studies which indicate that such effects have been found in certain animal tests.[198]

ECETOC, the European Chemical Industry Ecology and Toxicology Centre, has also published several reports on matters which concern its members. One of its recent reports dealt with carcinogens and provided "a definition of a mutagen," but nothing more on reproductive hazards.[199]

A thorough study would be needed to evaluate the extent to which such organizations are dealing with reproductive hazards. Further, the policies of large firms would have to be assessed in order to determine actual practices which bear on reproductive hazards, a difficult task given concerns about proprietary information.

F. Conclusion

Efforts to identify occupational hazards to the reproductive health of workers are increasing in the industrial countries of Western Europe and in international organizations which deal with labor, public and occupational health, and the chemical industry. These efforts, of recent vintage, have yet to produce more than a few conclusive findings. As a result, few regulations and other enforceable actions have been taken to date.

The European Community, the World Health Organization, and West German government agencies have highly structured health risk assessment programs run by technical experts, which are now investigating the mutagenic and teratogenic properties of various chemical and physical agents in the workplace. In doing so, they place heavy reliance on new techniques of biological (human) monitoring and medical surveillance, since these are considered superior to other health science techniques. But use of these new techniques is leading to differential findings of reproductive hazards for male and female workers and job candidates. Thus, the database being developed on reproductive hazards supports legal actions which will provide for differential protection of male and female workers.

Differential protection requirements produce differential costs for industry, and inevitably lead to differential hiring, job promotion and other employment practices with discriminatory impacts on male and particularly on female workers who are pregnant or fertile. This trend is strongest in West Germany, where technical experts dominate the standard-setting process; and is also strong

at the World Health Organization, where technical experts function without the pressure of social policies against discrimination.

However, pressure in the form of technical rationales for differential treatment has thus far failed to produce formal decisions for differential treatment by sex in two settings: in the European Community's enactment of its lead standard, and in Sweden, where worker protection is negotiated at each plant by labor and management. In these two settings, social policies against the discriminatory treatment of workers have been asserted and obstructed the trend towards differential protection and discrimination.

Political support for social equality, not any formal policy or law, forced the EC to retract its proposed lead standard, which would have ordained differential protection, and to promulgate a uniform standard. Whether such political support will be a consistent and successful force against any future attempts at differential treatment by the EC is not known at this time. It has certainly failed to force the EC to revise its radiation protection policies, which for several decades have supported discriminatory treatment of female workers on the basis of differential protection requirements. Similarly, the ad hoc nature of the process of negotiation at each industrial facility in Sweden offers no basis, at this time, for a confident determination that methods for protecting reproductive health in Sweden will not be discriminatory.

The most significant sources of expertise in Europe on reproductive hazards, WHO and the West German agencies, have

the greatest influence on EC initiatives. These two sources are relatively immune at this time to considerations of social equality, since they are comprised of technical experts, are driven by an emphasis on biological and technical accuracy, and use expert decision-processes without significant opportunities for public participation. Thus, their future findings as to reproductive hazards can be expected to be presented in a manner which promotes differential protection and, unintentionally, sexual discrimination, in most government decision-making in Western Europe.

The U.S. Congress, and OSHA and NIOSH officials, should carefully review these European and international developments, and design programs for the protection of reproductive health which will minimize unnecessary and undue tendencies toward differential protection and discriminatory outcomes. This design to preserve principles of social equality should encompass all stages in the development of protective standards--from the initial design of research programs and projects to ultimate decision-making. The challenge is considerable, since it will involve the reconciliation of biological diversity and social equality in a uniform social policy for the prevention of hazards to the reproductive health of workers.

Footnotes

1. For useful background, see Chemical Regulation and Cancer: A Cross-National Study of Policy and Politics, R. Brickman, S. Jasanoff and T. Ilgen, report to the National Science Foundation, NSF/PRA-82047, Washington, D.C. (1982).

2. Treaty Establishing the European Economic Community, Rome, 25 March 1957. (herein cited as EC Treaty). The Treaty and other basic legal materials collected in Basic Community Laws, B. Rudden, D. Wyatt, ed., Clarendon Press, Oxford (1980).

3. W. Germany, France, Italy, Belgium, the Netherlands, Luxenbourg, England, Ireland, Denmark, and Greece constitute current EC membership.

4. See fn. 1, supra, at pp. 61-62; pp. 320-331.

5. European Community Council Directive 75/117, 10 February 1975.

6. E.C. Council Decision 74/325, 27 June 1974; Official Journal of European Communities, L185/15, 1974.

7. E.C. Draft Council Resolution, 15 Dec. 1977; Official Journal of the European Communities, n. C9/2, 11 Jan. 1978.

8. Id at p. C9/10. See also Opinion of the Economic and Social Committee of 21 June 1978 on the draft resolution, Official Journal of the European Communities, n. C 283/19, 27 Nov. 1978, which approved the draft and stressed the preventative aspects of EC initiatives to follow, reliance on the radiation standards system, the important role of industrial medical officials, and the value of using biological indicators for human (biological) monitoring.

9. E.C. Parliment Resolution; Official Jnl. European Communities, n. C 163/13, 10 July 1978.

10. E.C. Council Resolution, 29 June 1978; Official Jnl. European Communities, n. C165/1, 11 July 1978, pp. 1-13.

11. 29 U.S.C. of 651 et seq.

12. See fn. 9, at p. 3.

13. Id, at p. 10.

14. Id, at p. 13.

15. Id, at p. 8.

16. E.C. Proposal for Council Directive, 6 March 1979; Official Jnl. European Communities, n. C 89/6, 5 April 1979.

17. E.C. Parliment Resolution; Official Jnl. European Communities, n. C 59/73, 10 March 1980.

18. Proposed Text Changes for Council Directive, 15 Feb. 1980, Official Jnl. European Communities, n. C 59/74, 10 March 1980.

19. E.C. Council Directive 80/1107, Official Jnl. European Communities, n. L 327/8, Dec, 3, 1980.

20. Id, Article 6, at p. 10.

21. Personal Communication, Dr. Alexander Berlin, Director, Health and Safety Directorate, EC, January 1984.

22. E.C. Proposal for Council Resolution on a Second Programme of Action, 4 Nov. 1982; Official Jnl. European Communities, n. C 308/11, 25 Nov. 1982.

23. Opinion of the Economic and Social Committee of 28 April 1983, Official Jnl. European Communities, n. C 176/16, 4 July 1983.

24. EC Council Directive 67/548, 27 June 1967; as amended by Directives 69/81, 19 March 1969; 70/189, 14 March 1970; 71/144, 29 March 1971; 73/146, 25 June 1973; 75/409, 14 July 1975; 79/831, 15 Oct. 1979 (the "Sixth Amendment"); and by Commission Directives 76/907, 30 Dec. 1976; and 83/467, 29 July 1983.

25. 48 Fed. Reg. 53280, Nov. 25, 1983.

26. See Annex VI, Part VI (D) of 3.3 to the Directive as amended. Also see Annex VIII for mutagenesis test requirements.

27. Id. at 3.4. also see Annex VIII for teratology test requirements.

28. See Annex III (3.13) to the Directive as amended. (fn. 24).

29. EC Council Directive, 24 June 1982.

30. The EC has also struggled with the development of harmonized requirements for other chemical industry activities and products such as pesticide and food additives, and these developments will ultimately bear on the health of workers. See discussion in Chemical Regulation and Cancer, fn. 1 supra.

31. See fn. 1 supra, at pp. 323-324.

32. Id.

33. Id.

34. Id.

35. See fn. 24, supra.

36. EC Euratom Directive, 2 Feb. 1959, Official Jnl. European Communities, 7, 1959-1962, at p. C6041.

37. Id, Article 6, at p. C6046.

38. Id, Articles 8, 9 at p. C6047.

39. Id, Articles 10, 15 at p. C6049, 6050.

40. Id, Articles 23, 24, 25 at p. C6053, 6054.

41. EC Council Directive 76/579, 1 June 1976, "Revised Basic Safety Standards against Dangers of Ionizing Radiation", Official Jnl. European Communities, L 187/1, 1976, ay p. C6215.

42. Id, Article 1, at p. C6218.

43. Id, Article 6, at p. C6221.

44. Id, Article 7, at p. C6222.

45. Id, Articles 8, 10, 11, 12 at pp. C6222-6224.

46. Id, Articles 15035, at pp. C6225-6230.

47. EC Council Directive 80/836, 15 July 1980, Official Jnl. European Communities, L 246/1, 1980, at p. C6350.

48. See generally, Assessment of Toxic Agents at the Workplace, A. Berlin, et al., eds., Proceedings of EC-OSMA-NIOSM Conference on the Roles of Ambient and Biological Monitoring, Dec. 1980, Luxembourg; Nijhoff Publishers, The Hague, 1984. Also see "Human Rights Versus Occupational Medicine", G. Atherley, Canadian Centre for Occupational Health and Safety, Queens University, Kingston, Canada, March 4, 1982.

49. See Assessment..., fn. 48, supra, at pp. 113-117.

50. Personal communication, Dr. Alexander Berlin, Director, EC. Health and Safety Directorate, Jan. 1984. For a survey of research findings indicating other differential biological and health impacts by sex, see J. Denning, "The Hazards of Women's Work," New Scientist, 17 January 1985, pp.12-15.

51. See Assessment..., fn. 48, supra, at p. 177. Also see pp. 71-83 for a summary of recent advances in biological monitoring.

52. E.C. Proposal for Council Directive, "Protection of Workers from Harmful Exposure to Metallic Lead and its Ionic Compounds at Work", 10 Dec. 1979; Official Jnl. European Communities, n. C 324/3, 28 Dec. 1979.

53. Id, at p.3.

54. Id, Articles 6, 7, at pp. 4, 5.

55. Id, Articles 8, 9, at p. 5.

56. Id, Article 12, at pp. 5, 6.

57. Id, Article 16, at p. 6.

58. International Environment Reporter; "Current Reports", Nov. 12, 1980, pp. 517-518, and "Current Reports", Nov. 19, 1980, P. 546.

59. E.C. Debates of the European Parliment, 7 April 1981, pp. 84-89.

60. Id.

61. Id.

62. Id.

63. Id.

64. E.C. Parliment Amendments to proposed Council Directive on the Protection of Workers from Harmful Exposure to Metallic Lead and its Ionic Compounds at Work, 7 April 1981, Official Jnl. European Communities, n. C 101/17, 4 May 1981.

65. Id, at p. 17. This apparently increased reliance on ambient as opposed to biolgical monitoring.

66. Id. at p. 18.

67. Id, at p. 18.

68. Id, at p. 19.

69. Id, at p. 19.

70. Id, at p. 20.

71. Id, at p. 22.

72. E.C. Council Directive 82/605, Official Jnl. European Communities, n. L 247/12, 23 August 1982.

73. Id, Articles 2-11 at pp. 13-16.

74. Id, Articles 6-9, at pp. 14-16.

75. Personal communication, Dr. Alexander Berlin, Director, EC Health and Safety Directorate, January 1980.

76. Id. See Chemical Regulation and Cancer, fn. 1, supra, for information on carcinogens.

77. International Environment Reporter, "Current Report", May 13, 1981, pp. 538, 539. However, the European Council of Chemical Manufacturer's Federation (CEFIC) has urged the EC to confine itself to the harmonization of certain procedures on a substance by substance basis, not on any broad categorical basis such as for occupational carcinogens; and to leave implementation and details to individual member states. International Environment Reporter, "Current Report", July 8, 1981, pp. 936, 937.

78. See fn. 3, supra, Article 119.

79. E.C. Council Directive 75/117, 10 Feb. 1975, "Application of the Principal of Equal Pay for Men and Women", Official Jnl. European Communities, n. L 45/19, 1975.

80. Id.

81. E.C. Council Directive 76/207, 9 Feb. 1976, "Implementation of the Principle of Equal Treatment of Men and Women as Regards Access to Employment, Vocational Training and Promotion, and Working Conditions", Official Jnl. European Communities, n. L 39/40, 1976.

82. Id, Article 2.

83. E.C. Council Directive 79/7, 19 Dec. 1978, "Progressive Implementation of the Principle of Equal Treatment of Men and Women in Matters of Social Security", Official Jnl. European Communities, n. L 6/24, 1979.

84. Id, Article 4.2.

85. E.C. Proposed Council Directive, 5 May 1983, "Implementation of the Principle of Equal Treatment for Men and Women in Occupational Social Security Schemes", Official Jnl. European Communities, n. C 134/7, 21 May 1983.

86. E.C. Debates of the European Parliment, 10 Oct. 1978, pp. 65-74.

87. But see Commission of the European Communities v. United Kingdom of Great Britian and N. Ireland, European Court of Justice, 1 CMLR44 (8 Nov. 1983), in which the EC brought suit against one of its members for failing to adequately implement Council Directive 76/207.

88. See Deterrence and Compensation: Legal Liability in Occupational Safety and Health, F. Morgenstern, Int'l Labor Organization, Geneva, 1982.

89. Defrenne v. Sabena, European Court of Justice, Case 149/77, Judgment of 15 June 1978.

90. See fn. 1 at pp. 262-265, 291-303 for useful background.

91. Id. VCI has provided the leadership for CEFIC. The European-wide chemical association which has been actively involved in EC developments affecting occupational health in the chemical industry.

92. Id. Also see pp. 291-303. Union participation at the plant level is provided for by German Worker Co-Determination Laws, which authorize Worker's Councils (Betriebsrat).

93. West Germany, Act on Protection against Dangerous Substances, Sept. 16, 1980, Federal Law Gazette I, n. 58 p. 1718.

94. West Germany has notified the EC that this Act represents national legislation which conforms to the EC's Sixth Amendment, cited at fn. 24, supra.

95. See fn. 93, supra at Article 3.

96. See fn. 93, supra, at Articles 7, 8, 9.

97. See fn. 93, supra, at Article 17.

98. See fn. 93, supra, at Article 21.

99. Id.

100. West Germany, Ordinance on Dangerous Substances Used in the Occupational Environment, 12 Nov. 1980, Federal Law Gazette I, n. 72, p. 2069.

101. West Germany, Ordinance on Dangerous Substances Used in the Occupational Environment, Division III, 8 Sept. 1975, Fed. Law Gazette I, n. 107, p. 2493.

102. Id, Division IV.

103. Id.

104. Id, Annex I, II.

105. West Germany, Law on Industrial Medical Officer and Other Experts, 12 Dec. 1973, Federal Law Gazette I, n. 105, p. 1885.

106. See fn. 101, supra.

107. West Germany, Hazardous Incident Ordinance, 27 June 1980, as supplemented by subsequent guidelines and regulations. See fn. 29, supra, for EC's "Seveso Directive".

108. See fn. 1 at pp. 442-446.

109. Id, at pp. 78-79, 152-158, 114-124, 293-305. Also see Confidentiality of Data and Chemicals Control, OECD, Paris, 1982, for further information: e.g., "There is no specific German legislature granting the general public access to administrative documents. It is totally at the discretion of an administration to release documents...", at p. 25.

110. See fn. 1, supra, at pp. 442-446, and Appendix I.

111. See Maximum Concentration at the Workplace and Biological Tolerance Values for Working Materials, Report No. XVIII, Commission for Investigation of Health Hazards of Chemical Compounds in the Work Area, Deutsche Forschungsgemeinschaft, Bonn, 1982. Also see fn. 1, supra, at pp. 144-145, 225-226.

112. Id, at pp. 7, 8.

113. Id, at pp. 13-48.

114. Id, at pp. 7, 8.

115. Id, at pp. 54, 55.

116. Id, at pp. 67-72.

117. Sections 611a, 612 (3) of BGB (Civil Code); and Law to Ensure Equal Treatment of Men and Women in Employment, BGB, Part I, p. 1308, August 13, 1980.

118. See Part V B 4 of this report.

119. West Germany, Law Protecting Pregnant Women in Employment, BGB, part I, Section 4, p. 315, 1968.

120. West Germany, Maternity Protection Act, 25 June 1979 part I, n. 32, p. 797, 30 June 1979.

121. *Id.*

122. Id, Division II. The accident insurance scheme is under the direction of the BG, See fn. 109, 110, 111.

123. Id.

124. Id, Division III.

125. Id, Division II.

126. West Germany, Law Respecting Equality of Treatment for Men and Women at the Workplace and the Maintenance of Claims in the Event of the Transfer of Establishments, 13 August 1980, BGB, Part I, n. 48, p. 1308, 20 August 1980, at Article I.

127. West Germany, Basic Law, Article 3.

128. See fn. 1 for considerable discussion of the German legal system and the opportunities afforded for legal challenges; e.g., at pp. 114-124, 293-305. Also personal communication, Prof. Jost Delbruck, University of Kiel, Center for International Law, 1983.

129. See Government Regulations of the Occupational and General Environments in the U.K., U.S.A., and Sweden, R. Williams, Science Council of Canada, Background Study, n. 40, 1977, for historical perspective.

130. See "Democracy in the Workplace", H. and J. Bernstein, Transatlantic Perspectives, n. 1, June 1979; "Worker Participation in Protection: The Swedish Alternative", R. Kasperson, Environment, v. 25, n. 4, May 1983, "Biological Monitoring: Comparative and International Perspectives", J. Delbruck, Univ. of Kiel, unpublished report for M. Baram project on Biological Monitoring, 1983.

131. Id, R. Kasperson.

132. Id.

133. Id. Also see Regulating America, Regulating Sweden, S. Kelman, MIT Press, Cambridge, MA, 1981; and Worker Training and Education in Occupational Safety and Health: A Report on Practices in Six Industrial Western Nations, E. Heath, OSHA Report, 1981; as "Working for Health: The Swedish Alternative", M. Witt, Just the Facts, OSHA, Sept. 13, 1979.

134. Arbetsmiljolagen [AML], SFS 1977: 1160 and 1166; amended by SFS 1980:245; SFS 1980:428; SFS 1982:674. Subsequent laws and amendments implementing requirements (e.g., for cadmium).

135. "Occupational Safety and Health Law in Sweden and the United States: Are There Lessons to be Learned by Both Countries", B. Fleischauer, Hastings International and Comparative L. Review, v. 6, p. 283 (1983) at pp. 295-296.

136. Id, at pp. 299-303.

137. Id. Also see, for example, Working Environment Agreement, SAF-LO-PTK, 1979.

138. Id, at pp. 303-318.

139. See fn. 134, at Ch. 2, s. 6; Ch. 3, s. 1; and Ch. 3 s. 15, 16. Also see Swedish Legislation Working Environment, Ministry of Labor, 1978, at p. 12.

140. Id, at Ch. 4, s. 4; Ch. 6, s. 7.

141. See, for example, Law No. 834, 16 Nov. 1973, which authorized the exclusion of women from certain jobs.

142. See fn. 135, at pp. 318-321. Also see "Unions Critical, Employers Largely Satisfied", and A Working Environment 1981 in Sweden, Swedish Work Environment Assoc., Stockholm, 1981.

143. See fn. 135, at pp. 329-331; and "Unions Critical..." Id.

144. NBOSM Instructions No. 100, 1 May 1978.

145. Reported in TCO Tidningen, n. 1 January 20, 1984.

146. As reported by "Equal Lead Limits for Men and Women", Working Environment 1982 in Sweden, Swedish Work Environment Assoc., Stockholm, 1982.

147. See Consensus Report for Inorganic Lead, NBOSM, (undated).

148. See fn. 142, Working Environment in Sweden, 1981, at pp. 18-19.

149. For a summary of these laws, see Co-Determination in Sweden, Swedish Trade Union Confederation, Stockholm, 1979.

150. See Trade Union Social Work, Swedish Trade Union Confederation, Stockholm, 1981.

151. See How the Unions Cooperate in Labor Market Policy in Sweden: LO Program of Action, Swedish Trade Union Confederation, Stockholm, (undated circa 1979).

152. Id, at pp. 28-34, 54-60, 65-66.

153. See This is How We Work for Equality Between Men and Women in Working Life and in the Trade Unions, Swedish Trade Union Confederation, Stockholm, 1980.

154. See "State of the Art: Recent Legislation on Worker's Health and Safety," L. Parmeggiani, Int'l. Labour Review, v. 121, n. 3, 1982. Also see fn. 1, at p.332, and enactments cited.

155. ILO Recommendation on Occupational Health Services, No. 112 (1959).

156. See, for example, ILO Convention on Occupational Safety and Health and the Working Environment, No. 155; Resolution on Future ILO Action in the Field of Working Conditions and Environment, 24 June 1975; Resolution on Working Conditions and Environment, 21 June 1976; and ILO Report on Safety and Health and the Working Environment, No. VII(a)(1), 1980. This last item includes the ILO "List of Instruments Concerning Occupational Safety and Health Adopted by the ILO Since 1919," which specifies numerous ILO Conventions and Recommendations, none of which pertain directly to reproductive risks in particular.

157. ILO Report (with WHO) on Migrant Workers and Occupational Safety and Health, August 1975. See chapter on "The Migrant Woman at Work," p.63 et seq.

158. ILO Chemical Industries Committee, Report on Industrial Relations and Collective Bargaining Practices in the Chemical Industries, No. III, 1982; Deterrence and Compensation, F. Morgenstern, ILO, 1982; and ILO Labour Conference (70th Session), Report on Occupational Health Services, No. V(1), 1984. It should be noted that considerable emphasis is placed on the usefulness of medical surveillance and biologic

monitoring techniques in most of the otherwise general treatment of the ILO reports cited in footnotes 156 and 158.

159. See WHO Reports on Environmental and Health Monitoring in Occupational Health, 1973; and Early Detection of Health Impairment in Occupational Exposure to Health Hazards, 1975.

160. WHO Recommended Health-Based Limits in Occupational Exposure to Pesticides, Tech. Rpt. Series 677, 1982.

161. Id., at pp. 19-32.

162. Id., at pp. 43-54.

163. Id., at pp. 57-79.

164. Id., at pp. 85-104.

165. WHO Recommended Health-Based Limits in Occupational Exposure to Selected Organic Solvents, Tech. Rpt. Series 664, 1981. See pp. 5-22 for toluene.

166. Id.

167. WHO Recommended Health-Based Limits on Occupational Exposure to Heavy Metals, Tech. Rpt. Series 647, 1980.

168. Id., at p. 12.

169. Id., at p. 19.

170. Id., at p. 23.

171. Id., at p. 87, 99.

172. Id., at p. 112, 113.

173. Id., at p. 41.

174. Id., at pp. 41, 74, 75.

175. Id., at p. 71.

176. As of 1982, some 19 reports on Environmental Health Criteria for specific hazardous agents had been published by WHO. See inside, front cover, WHO report, fn. 177, below. Many contain findings or reports of reproductive effects: see n. 16 on Radiofrequency and Microwaves, 1981, at p.82.

177. WHO, Environmental Health Criteria 20: Selected Petroleum Products, IPCS, 1982, at p.20.

178. WHO, Env. Health Criteria 3: Lead, 1977, at p.121.

179. Id., at p.123.

180. A draft of most sections was completed by the summer 1983.

181. Personal communication, Dr. Lorenzo Siminato, IARC, August 1983. Dr. Siminato provided copies of various reports from IARC's collection of studies of chromosome aberrations, micronuclei, sister chromatid exchanges, and urinary mutagenicity assays. However, IARC's main efforts remain fixed on carcinogenicity.

182. WHO, Health Aspects of Well-Being in Working Places, Euro Report 31, Copenhagen Regional Office, 1979.

183. Personal communications, Dr. K. Jaeger and Dr. M. Mercier, WHO IPCS; and Dr. A. David, WHO Occupational Health Programme August, 1983. For example, biological monitoring of urine and blood for heavy metals (lead, cadmium), for pesticides, for organic solvents; audiometry in screening and bio-monitoring for noise exposure: for miscellaneous reproductive hazards (as reported in August, 1983, draft of overview

report on reproductive risks; etc. See reports on these occupational hazards discussed and cited above.

184. Personal Communication, Dr. Victor Morgenroth, OECD, Paris, August, 1983.

185. See fn. 1, supra, at pp.347-360.

186. Id., see OECD, Confidentiality of Data and Chemicals Control, 1982; in particular, the six proposed principles for protecting proprietary information, at pp.77-90, which has led to OECD's Draft Recommendations Concerning the Protection of Proprietary Rights to Data Submitted in Notification of New Chemicals (restricted), 22 June 1983. Also, see, Environment Committee, 1983 Draft Programme Proposals (restricted), 18 March 1982, which includes the agenda for future activities of the Chemicals Group, none of which pertain directly to reproductive hazards in the workplace, although the several specific chemicals designated for study may raise reproductive health issues, once underway.

187. OECD, Guidelines for Testing of Chemicals, 1981, Preface.

188. Id., see also OECD, Principles of Good Laboratory Practice, 1982; OECD Council Decision on "Mutual Acceptance of Data," c(81)30, 12 May 1981; and OECD, Provisional Data Interpretation Guides, May 1983.

189. Id.

190. Id., Section 4, pp.1-3.

191. Id., Section 4, p.5.

192. Id., Section 4, pp.7-11.

193. Id., Section 4, Subsection 414, pp.1-6.

194. Id., Section 4, Subsections 451, 452, 453.

195. See fn. 1, supra, pp.xvi-xxvii for a listing of numerous organizations, many of which are private membership. Also see pp.251-289 for general background.

196. See CONCAWE Catalog of Reports, report 5/83, the Hague, 1983; and reports 3/83, 1983 and 2/80, 1980, which respectively cover the subjects indicated in the text.

197. CONCAWE, report 1/83, 1983, at p.12.

198. CONCAWE report, 7/82, 1982, at p.32.

199. ECETOC, A Contribution to the Strategy for the Identificati and Control of Occupational Carcinogens, Monograph No. 2, Brussels, 1980.